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Locational and Flow Analysis of the Ontario Broiler Chicken Industry

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LOCATIONAL AND FLOW ANALYSIS OF THE ONTARIO BROILER CHICKEN INDUSTRY

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INTRODUCTION

This study deals with the economic geography of the Ontario broiler chicken[1] industry. The broiler industry is defined as one "encompassing all those business activities associated with broiler production inputs such as chicks and feed, the growing of broilers, and their processing and distribution from processing plants to final consumers."[2] The broiler industry is a segment of the poultry industry.

This study will deal specifically with the locational or spatial aspects of the industry and with the flow of produce from processing plant to consumer.

Objectives of the Research

The first objective of this study is to increase factual knowledge of the broiler industry, especially in the field of marketing. The need for this has been clearly indicated by the Broiler Enquiry Committee of the Ontario Poultry Council, which reported: "The lack of research into the marketing of Canada's poultry products is everywhere apparent."[3]

[1] "'Broiler chicken' means a chicken produced from the egg of a domestic hen other than a chicken that weighs more than five and one-half pounds or is more than six months of age." Ontario Regulation 100/65 under the Farm Products Marketing Act (Toronto: Parliament Buildings, 1965), Plan 2(a).

[2] Ronald L. Mighell and Lawrence A. Jones, Vertical Coordination In Agricultural (Washington: U.S. Government Printing Office, 1963), 188.

[3] Report: Broiler Enquiry Committee, J. Ross Cavers, chairman (unpublished report submitted to the Ontario Poultry Council, Jan. 23, 1962), 3.

The second objective is to determine the associated locational factors of the industry, especially for the grower segment. The broiler growers in most provinces of Canada have organized themselves into producer marketing boards, which have extensive powers to regulate boiler production in their provinces. These boards also influence the location of production units, and often greatly restrict the movement of production locations.

The third objective of this study is to measure the effects of the Ontario broiler marketing board on the degree of integration in the industry and on the size of the industry's retail market. Although structural relationships in the shell-egg and turkey industry of Ontario have been analyzed,[4] no such study has been done on the broiler chicken industry.

Study Site

The study site is Southwestern Ontario (Figure 1). The areal unit used throughout the study is the county, of which there are thirty within the study site. In some cases reference will be made to the whole province, especially when dealing with the retail market.

Southwestern Ontario has been chosen for the study site, for several reasons. Until 1968 it had the largest provincial broiler production in Canada. Almost all the broiler produce is consumed within

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[4]Thomas R. Jones, The Organization and Structure of the Ontario Shell Egg Industry (unpublished M. Sc. thesis, University of Guelph, 1966). Richard P. Flis, Contractual Arrangements in the Ontario Shell Egg Industry (Ibid., 1967). Clifford B. Matthews, An Econometric Model for Ontario Turkey Prices (Ibid., 1968).

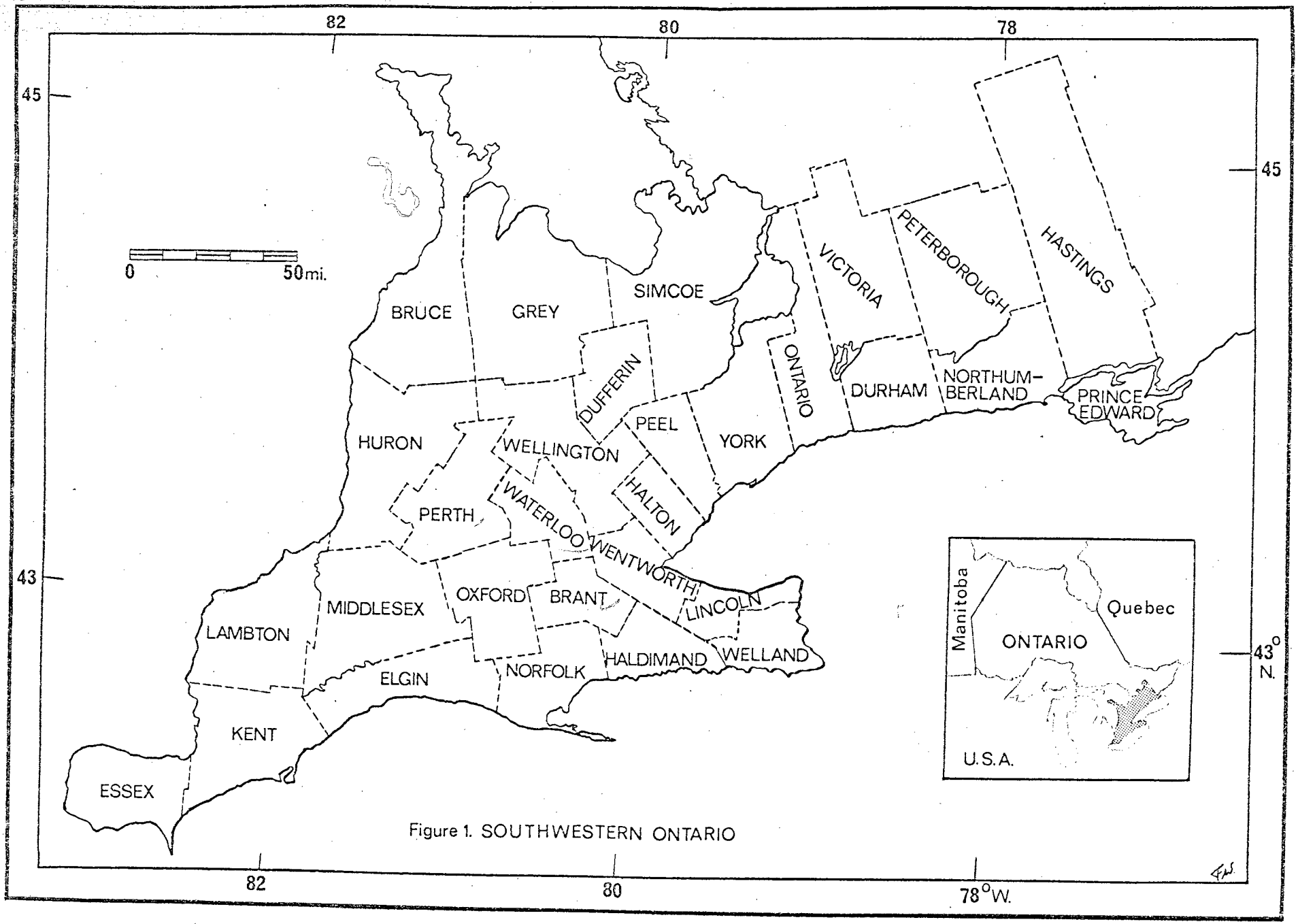

Figure 1. SOUTHWESTERN ONTARIO

the study site. Its growers have organized themselves into a provincial marketing board, which has accumulated a great deal of information on its members. Only three production units, totalling less than one per cent of the provincial broiler production, are located outside Southwestern Ontario, two in counties not contiguous to the study site.

Methodology

Data have been collected from federal agencies, the Ontario Broiler Board, and directly from the different segments of the industry. The major part of the study deals with the producer and processor groups, both of which have been contacted via questionnaire and in person. Advice and information has also been sought from persons not directly related to the industry.

Basically the industry is seen as and treated as a system: "A set of objects together with relationships between the objects and their attributes".[5] The objects of the system are the different segments of the industry as outlined in Figure 3. The relationships between the objects refer to such matters as the type of contract between producer and processor, or the distance between hatchery and producer. The attributes of the objects are for example the function, size and location of the segments of the industry.

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[5]A.D. Hall and R.E. Fagen, "Definition of System", in General Systems, ed. by L. von Bertalanffy and A. Rapoport (Ann Arbor, Mich.: Braun-Brumfield, Inc., 1956), 18.

After a general description of the main attributes of the broiler industry (location and size), the locational factors associated with broiler growing will be probed. Location analysis will be on a county basis, using correlative techniques and confidence levels. Since broiler production is only a part of total poultry production, historical shifts in poultry production will be used to help identify economic forces influencing the location of broiler production. Present day patterns of broiler, turkey, and pullet production will be analyzed in terms of population density and capital investment in agriculture. Deviations from the general patterns of poultry production location, and of broiler growing in particular, will be explained in terms of their relevant causes.

The location of broiler processing plants will be viewed in relation to the location of the producers, the location of population centres, and the type of processing employed.

Flow charts will be constructed from the returns of the processor questionnaires to show the movement of broilers from processor to consumer. The returns will be divided into six categories. The division will be based on the size of the processing plants and their method of processing, to show the type of retail outlets used by each category.

Since the broiler marketing board plays a very important role at the producer level, the board's relation to the producer's size and location will be scrutinized, as well as the change in the degree of integration and the size of the retail market since the inception of the marketing board in 1965. Much of the information for this section is supplied by the Ontario Broiler Board, while other data have been compiled by the Dominion Bureau of Statistics.

I DESCRIPTION OF THE BROILER INDUSTRY

Historical Overview

The broiler chicken is a force-fed chicken, which is killed at the age of eight to ten weeks. Its meat is tender, and compares to young beef as fowl compares to meat of an old cow. Specialized production of broiler meat is a fairly recent trend, started in the United States in the 1930's, with Canada following after World War II.[1,2]

When the second world war drew to a close a shortage of poultry meat started to develop in Canada. The Canadian poultry press tried to serve its readers by reporting the progress made in the production of broiler chickens south of the border,[3] and by outlining the qualities a chicken should have to be suitable for meat production.[4] The following year it reported a growing broiler production with one Maritime producer growing 16,000 broilers that summer.[5]

The growth of the broiler industry in Ontario and Canada from 1953 to 1968 is shown in graph form (Fig. 2). In sixteen years the output of broiler meat grew in Ontario almost tenfold, and in all of

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[1]Rolland Poirier, "Canada's Broiler Production," Agricultural Institute Review, XIV (March-April, 1959), 40-44.

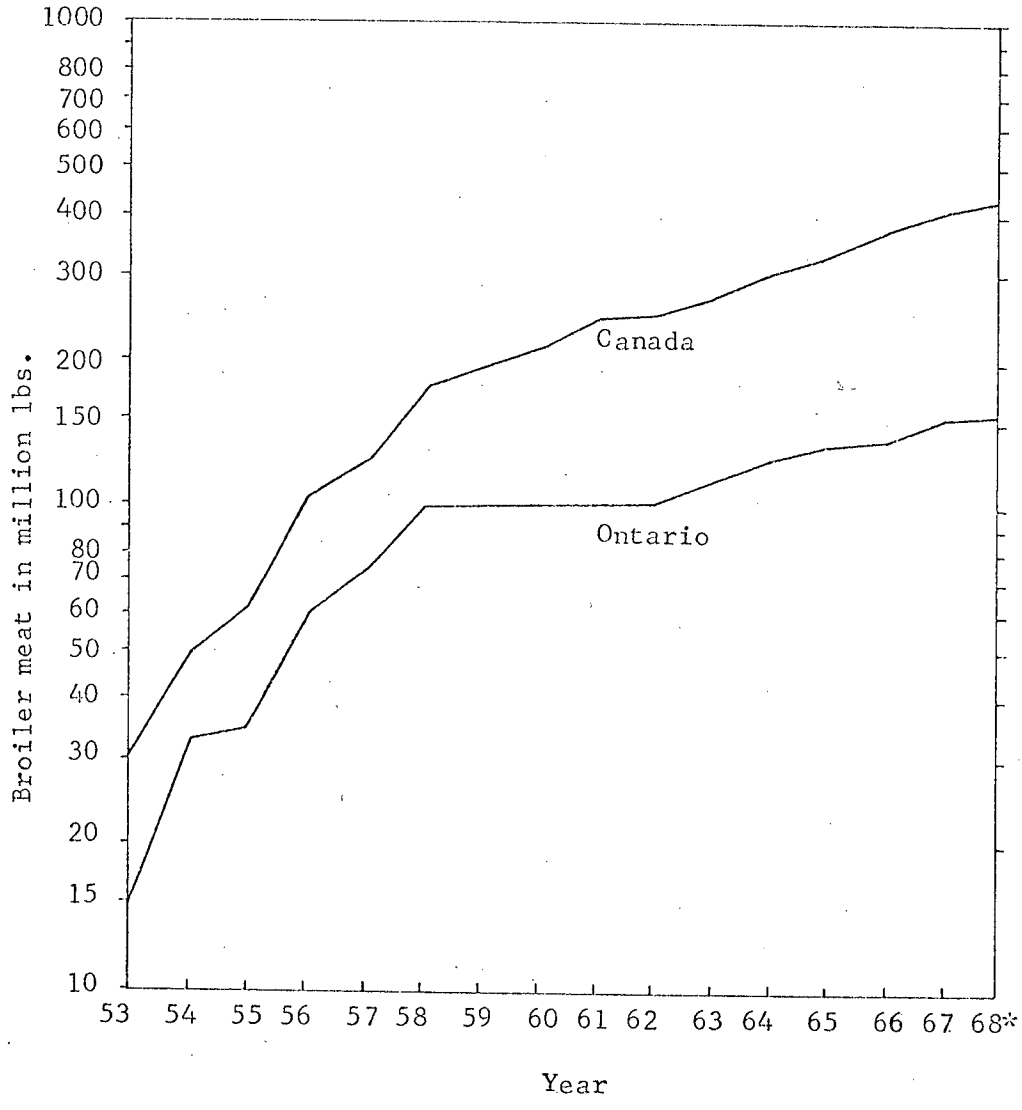
[2]J. Ross Cavers, "Integration in the Broiler Industry," Ibid., 53-54.

[3]"2,500 Square Miles of Broilers," Canadian Poultry Review, LXIX (Aug., 1945), 24-25, and (September, 1945), 20-25.

[4]J. H. Vondell, "Broiler Qualities," Ibid., (November, 1945), 7.

[5]'Bluenose', "Maritime Notes," Ibid., LXX (May, 1946), 16-18.

Fig. 2--Broiler Poundage slaughtered in Registered Stations in Ontario and Canada, 1953-1968.



Source: C.D.A., Poultry Market Review, 1953-67.
Poultry Market Report, Jan. 3, 1969

1953-60: dressed chickens weighing less than four pounds;
1961-68: eviscerated chickens weighing less than four pounds;
* 1968 data preliminary.

Canada forteenfold. From 1953 to 1960 broiler production is reported on a dressed weight[6] basis, which is 87 per cent of live weight. Since 1961 dressed weight basis has been changed to the eviscerated weight basis, which is 75 per cent of live weight. In all cases only slaughtered chickens weighing less than four pounds have been included.

During the 1950's the growth of the broiler industry has been rapid, and has often proceeded in spurts. This rapid growth has been possible because of three factors: genetic improvement, technical advances, and credit financing.

The genetic improvements in the broiler since 1945 have resulted in faster rates of gain on almost half the amount of feed. In 1945 a broiler chick should have reached three pounds in twelve weeks on three times three and one-half pounds of feed.[7] In 1955, twenty-seven hundred broilers, representing nine strains and crosses, averaged 2.95 lbs. at nine weeks of age on 2.66 lbs. feed per pound of gain.[8] In 1968, 2268 broilers were tested under similar circumstances with the following results: At eight weeks they weighed 3.49 lbs. on 1.93 lbs. feed per pound of gain.[9] This shortening of the growing period itself has caused

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[6]Two processes are used to slaughter chickens, New York dressed and Evisceration. The main differences are that an eviscerated chicken is trimmed more and is subjected to a higher scalding temperature than a New York dressed chicken. The difference in market weight is approximately thirteen per cent.

[7]Vondell, "Broiler Qualities," 7.

[8]Arkansas Meat Performance Broiler Test No. 4, Winter 1955 (Fayetteville, Ark.: Agricultural Experiment Station, Division of Agriculture, University of Arkansas, July, 1955).

[9]Arkansas Meat Performance, Egg Phase And Reproduction Test, No. 12 (Ibid., September, 1968).

an increase in production, while it has reduced the price of production.

Technical advances at the farm level, such as improved heating and ventilating techniques, made year round production possible. At the same time mechanized feeding and watering reduced labour requirements per bird and made larger production units feasible and desirable. Advances in retailing methods gave rise to chain stores, which demanded large volumes of broilers at specified times. These large volumes could only be supplied by large processing plants, who had contracts with growers for broiler deliveries at specified dates. As production increased, more coordination was needed between processors and producers to affect a smoothly operating industry.

Building new growing facilities and expanding existing ones required large infusions of capital. Some of this capital was supplied by banks, some by hatcheries, feed companies, and processors. Necessities for growing broilers such as feed and chicks were often bought on credit. As a result coodination and credit buying led to contractual arrangements, where the grower, in return for credit and sometimes mortgages, promised, for example to use brand X feed, type Y chicks, and deliver the broilers to plant Z at a specified time.

Fluctuations in production led to 'boom and bust' cycles, culminating in bankruptcies of many a producer, hatchery, and processor. The feed company usually was the stronger party financially, and acquired the bankrupt facilities. The resulting change would be that the grower now promised to buy brand X feed, type X chicks, and deliver the broiler to plant Z, now owned by X.

Developments in the U.S. broiler industry showed that if these trends continued, sooner or later only integrators would process broilers and dictate production.[10] Integrators in this context are companies which own or control hatcheries, processing plants, feed mills, broiler grow-out operations, and sometimes also retail outlets. According to USDA data of 1960 the American broiler growers had relinquished their 'ideal' of being independent farmers. At that time three-quarters of the broilers were grown under contract, twenty per cent were grown by integrators, while only five per cent of the production was grown by independent farmers.[11]

Similar trends toward contract production and integration were visible in Ontario, caused chiefly by overproduction every two to four years. Efforts to establish a producer-controlled marketing board with powers to regulate production were crowned in April 1965 with the establishment of the Ontario Broiler Chicken Producers' Marketing Board. Since 1965 the Ontario broiler market has become stable and very profitable for the producers. Since September 1965 production quotas have been set for each three month period to allow an adequate market supply and a reasonable return for the producer. Chapters IV and V will deal more specifically with the broiler board.

The broiler industry is highly specialized and the broiler chicken is the result of the cross-breeding of strains especially selected for

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[10]Edward Higbee, Farms And Farmers In An Urban Age (New York: The Twentieth Century Fund, 1963), 29-32.

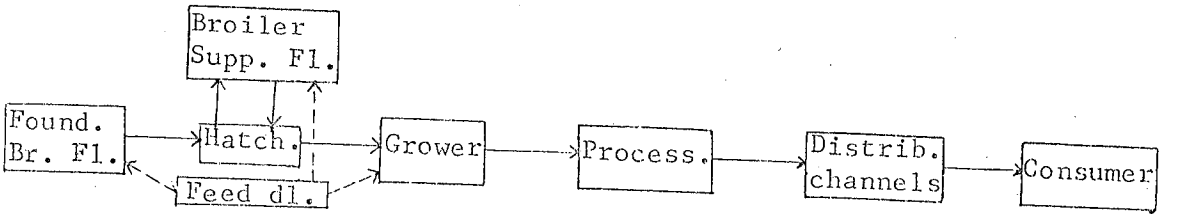
[11]Mighell and Jones, Vertical Coordination, 191.

meat production. As a result of intensive breeding and careful selection for fast rate of growth, disease resistance, high feed conversion ratio, and other factors, certain birds are selected to form the foundation breeder flock. The foundation breeder flocks are the grandparents of the broilers. These are generally mated with each other to produce 'strains'. These 'strains' are cross-bred in the broiler supply flocks or parent stock to supply the necessary quantity of eggs from which the broiler chicks are hatched. At the appropriate weight these broilers are killed at the processing plants. They finally reach the consumer through the retail food outlets. Thus six functional steps can be distinguished in the broiler industry.

1. Foundation Breeder Flock.
2. Broiler Supply Flock.
3. Hatcheries.
4. Broiler grow-out operations.
5. Processing plants.
6. Distribution channels.

One outsider has to be mentioned in passing, because without him the chicken would never reach the consumer. He is all the more important since he owns many operations in the middle four steps. This is the feed dealer; his importance will be discussed at length in Chapter V. A more visual representation of the entire process suggests itself (Fig. 3.).

Fig. 3--Broiler flow and feed supply.



From Egg to Broiler

Canada has two foundation breeders. Peel's Poultry Farm Ltd. in Port Perry, and Misener Poultry Farms Ltd. in Brantford. The latter produces under license for Shaver's Poultry, Galt. Both Peel and Shaver have their headquarters in Ontario and are international organizations. Since Ontario has only two foundation breeders no statistics of their production are available for publication. After personal research the author feels safe to assume, however, that during 1967 they supplied about 30% of the stock to build the Ontario broiler supply flock. The remainder came from the United States. The ratio has fluctuated in the past.

Table 1 shows that in 1967 Ontario's broiler supply flock was just about large enough to supply the provincial demand for broiler chicks. International and interprovincial movement of eggs and day-old chicks may be expected for several reasons: temporary shortages may develop or Ontario growers may decide to buy chicks in the U.S.; interprovincial imports are mainly from Quebec and Manitoba, while all international importations of broiler eggs and chicks come from the U.S.

TABLE 1

SOURCES OF BROILER SUPPLY FOR ONTARIO
(PERCENTAGES INDICATE THE PART OF THE TOTAL CONTRIBUTED TO THE NEXT STAGE IN THE ONTARIO PRODUCTION CHAIN.)

	INTERNATIONAL	ONTARIO	OTHER CANADA
Foundation Breader Flock	±70%	±30%	
Broiler Supply Flock	2.3%	97.6%	0.1%
Hatchery	0.8%	98.5%	0.7%

Source: Canada Department of Agriculture, Hatchery Outlook, Report #4 (Ottawa: The Queen's Printer, 1968), tables 5, 7, 9 12, 13.

Every hatchery has broiler supply flocks, and four of the twenty-three Ontario broiler hatcheries have grandparent stock (Fig. 4). Southern Ontario has seven hatcheries, three being very small.[12] Western Ontario has ten, mainly in Perth and Waterloo counties. Four hatcheries are located in Central Ontario and two of marginal importance to Ontario are found in Eastern Ontario. The broiler supply flocks are stationed with farmers, usually within a forty mile radius of the hatchery.

Pullets in the broiler supply flocks are productive during the last nine months of their fifteen months' life. During 1967, 978,432 pullets were added to the broiler supply flocks,[13] together with about 98,000 cockerels. At the same time 905,002 six-month old pullets were approved for the production of hatching eggs.[14]

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[12]Eastern Ontario has two small broiler hatcheries, of minor importance to Ontario growers.

[13]M.H. Mode, Poultry Division, C.D.A., Toronto, personal communication, November 16, 1968.

[14]J.H. Pettit, Department of Poultry Science, University of Guelph, personal communication, Nov. 15, 1968.

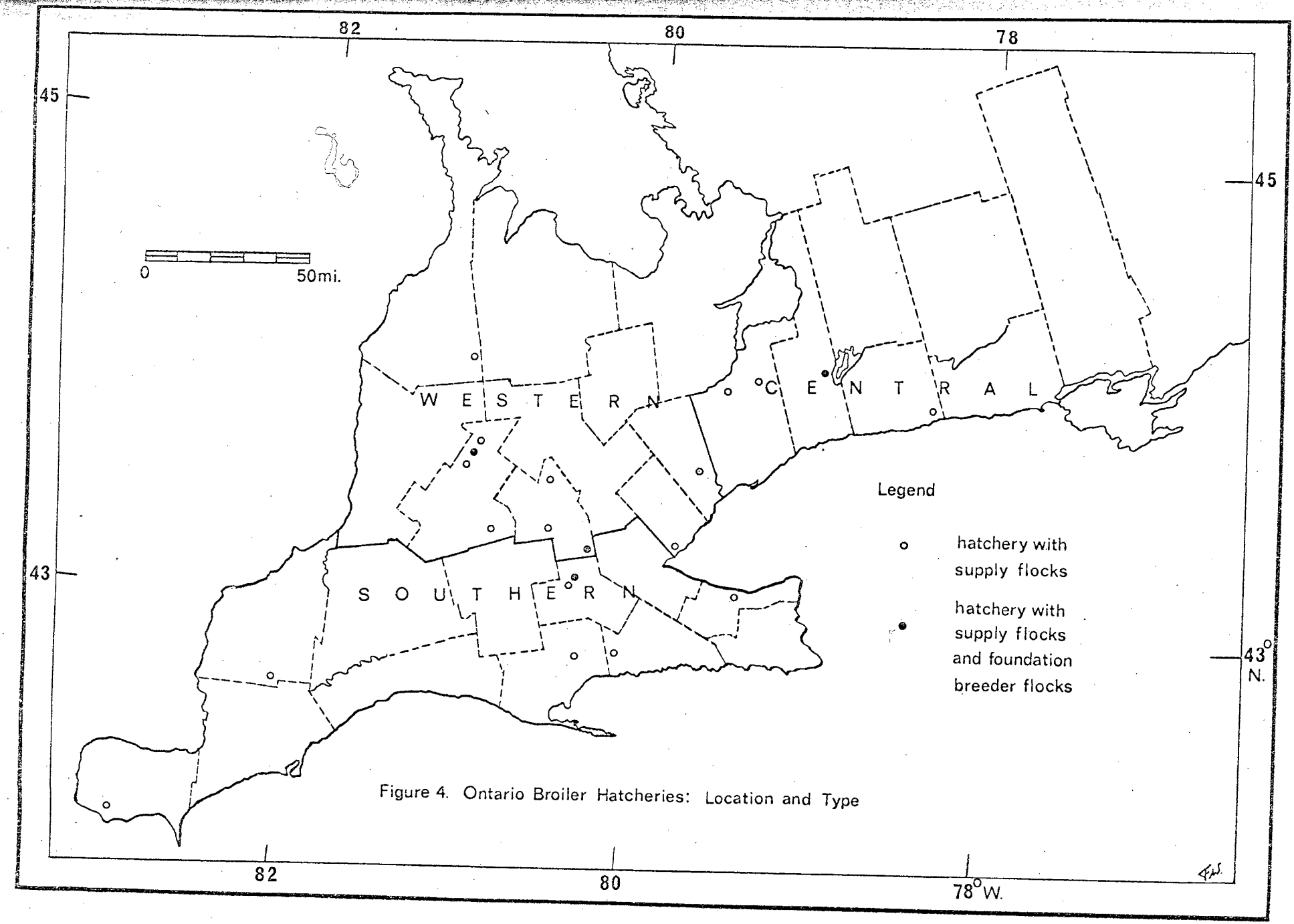

Figure 4. Ontario Broiler Hatcheries: Location and Type

The relative strength of the Ontario hatchery industry can be seen (Table 2), keeping two factors in mind: exports consisted mainly of breeding stock, and total Canadian imports of eggs and chicks were six and one-half times its exports. Ontario shipped eggs and chicks to all provinces but Prince Edward Island and Newfoundland, and eggs were shipped further than one-day old chicks. The exports were world wide. Movement into the province was mainly from the United States, Quebec, and Manitoba.

TABLE 2

ONTARIO'S SHARE OF CANADA'S EXPORT, IMPORT, AND INTERPROVINCIAL MOVEMENT OF EGGS AND CHICKS IN PERCENTAGES OF CANADIAN TOTAL.

CATEGORY	EXPORT	IMPORT	INTERPROVINCIAL	
			OUT	IN
Broiler eggs	23.0	7.6	24.8	3.2
Breeder eggs		7.9	n.a.	n.a.
Broiler chicks	78.4	8.9	52.3	5.6
Breeder chicks		33.0	n.a.	n.a.

Source: C.D.A. Hatchery Outlook, 1967.[15]

[15]Canada Department of Agriculture, Hatchery Outlook, tables 5, 8, 9, 12, 13, 15, 17.

Total Ontario hatch in 1967 of broiler chicks was 61,630,880 or 38.6 per cent of Canada's total.[16] Chicks placed with Ontario growers: 57,122,000,[17] of which 52,551,000 were marketed[18] at an average weight of three pounds per bird.[19]

Broiler Production

With the introduction of the Ontario Broiler Chicken Producers' Marketing Board in April 1965 every broiler grower received a production quota measured in square feet of floor space. The measurements were based on the area which the grower had used in the immediate past for growing broilers.

One of the main tasks of the marketing board has been to prevent overmarketing. In co-operation with other members of the broiler industry (hatchery, processor, and feed dealer) quotas are set for every three month period of the year. A quota of 90% means that each grower is allowed to use only 90% of his space for growing broilers during that period.

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[16] Ibid., table 5.

[17] Canada Department of Agriculture, Poultry Market Report (Ottawa: The Queen's Printer, Jan. 19, 1968).

[18] Ontario Broiler Chicken Producers' Marketing Board, Third Annual Report, 1967 (Burlington, Ontario, [1968]), 7.

[19] Ibid., 16.

Since the market demands different weights of broilers, a grower may choose between junior, special, or regular broilers. Whichever he chooses, the amount of poultry meat produced per square foot is about the same.

For statistical purposes a distinction is made between a grower and a production unit. Each grower has one production unit unless he produces in more than one county. In that case he will be listed as having one production unit for each county in which he operates. On the provincial level he will be counted only once. Hence quota total per county is the space devoted to broiler growing in that county.

Detailed regional data has been tabulated (Table 3), taken from the registration forms in the Ontario Broiler Board Office in Nov. 1968. No distinction has been made between owning and leasing of growing facilities.

A high concentration of broilers is found in the Niagara Peninsula, thinning out rapidly westward, and more slowly North-westward to Huron County. Peel County is abnormally low. East from Peel County the broiler density drops away from major highways. No broilers are found east of Hastings, except for the two production units in Grenville and Glengarry Counties. Broilers are not grown further North than Muskoka district, in which there is one production unit of 75,000 sq. ft. (Fig. 17).

Of the total growing capacity, Southern Ontario has 38.8 per cent, five-eights of which is located in Lincoln, Welland, and Wentworth Counties. Only ten per cent of the region's capacity is found in the counties of Elgin, Essex, Kent, Lambton, and Middlesex.

TABLE 3

BROILER GROWING CAPACITY BY COUNTY, NOV., 1968.

COUNTY	CAPACITY sq. ft.	PRODUCERS	PRODUCTION UNITS	AV. SIZE PER UNIT
Brant	293,485	15	16	17,343
Elgin	184,032	15	17	10,825
Essex	85,235	14	14	6,088
Haldimand	328,902	22	22	14,950
Kent	103,843	6	6	17,307
Lambton	111,616	5	5	22,323
Lincoln	1,973,480	94	96	20,557
Middlesex	103,558	10	11	9,414
Norfolk	595,266	36	38	15,665
Oxford	406,766	16	18	22,800
Welland	583,640	42	43	13,573
Wentworth	1,117,378	61	62	18,022
Bruce	381,232	19	21	18,154
Dufferin	160,406	9	9	17,823
Grey	462,172	23	23	20,094
Halton	410,093	24	24	17,504
Huron	1,258,287	55	59	21,327
Peel	122,304	6	6	20,384
Perth	1,037,555	25	27	38,428
Simcoe	508,972	23	23	22,129
Waterloo	934,287	43	44	21,302
Wellington	1,580,653	69	69	22,908
Durham	326,770	18	19	17,198
Hastings	55,708	5	5	11,142
Northumb'd	248,156	12	12	20,680
Ontario	481,924	20	20	24,096
Peterboro	236,518	14	14	16,894
Pr. Edward	166,154	7	7	23,736
Victoria	119,046	4	4	29,761
York	719,437	28	29	24,808
Muskoka	75,000	0	1	--
Glengarry	8,700	1	1	--
Grenville	66,518	1	1	--
Province	15,247,093	742	766	19,905

Western Ontario possesses 45.2 per cent. The Mid-Western Ontario region, consisting of Huron, Perth, Waterloo, and Wellington, had over 25 per cent of all the province's hens and chickens in 1963.[20] In 1968 this region accounted for 32.4 per cent of the Ontario broilers. The remaining 16.0 per cent is found in Central Ontario, half of which is in the counties of York and Ontario.

A few words have to be said concerning the average size of operation per county. Although there are 740 producers in Southwestern Ontario, on a county basis there are 763 production units, averaging 19,983 sq. ft. per unit. Notably low average sizes are found in Essex, Middlesex, and Hastings, where broilers are a byline for many of the growers. The four highest averages are found in Perth, Victoria, York, and Ontario. For further details see Table 3.

The smallest grower has 705 sq. ft. of growing space and lives in Elgin county. The largest producer has over 460,000 sq. ft. with production units in five counties. Four producers have more than 300,000 sq. ft., and together account for just over 10 per cent of all growing capacity.

Broiler Processing

In 1967, registered processing plants in Ontario killed 51,032,000 chickens under four pounds, weighing 153,220,000 lbs.[21] The Ontario

[20]Ontario Department of Economics and Development, Economic Survey Of The Mid-Western Ontario Region (Toronto: Parliament Buildings, 1965), 16.

[21]Canada Department of Agriculture, Poultry Market Review, 1967, XVII (Ottawa: The Queen's Printer, [1968]), table 21.

broiler board, which tries to keep track of every chicken, reports a three per cent higher marketing based on kill data.[22] Processing is done in many localities and chiefly in two ways: eviscerated and New York dressed. The main differences between the two methods is in scalding and trimming.

An eviscerated broiler has been exposed to a higher scalding temperature and is trimmed to about 75 per cent of live weight by removal of head, feathers, feet, and viscera. A New York dressed bird undergoes a much lower scalding temperature and is trimmed to about 87 per cent of live weight by removal of blood, feathers, and head. Evisceration has gained much prominence since the early fifties, partly because it is government inspected. New York dressed birds are preferred by many people of Mediterranean origin, and until 1968 was the only type used for the Kosher trade.

Although there are in Ontario sixteen broiler evisceration plants and twenty-two who use the New York dressed method, the latter account for only about fifteen per cent of the total kill.

Marketing

Almost two and a half years after the grandparents of the broilers are selected, the consumer can buy the finished product. Of the many food outlets available, the chain food store is the most important seller of broilers. Rising in importance are the chicken take-out places, ex-

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[22]Ontario Broiler Board, Third Annual Report, 7.

emplified by Kentucky Fried Chicken. Over one-tenth of the broilers are consumed in restaurants and take-out places showing chicken still to be a favorite for eating out. Independent stores and restaurants are the major sellers of New York dressed chicken; chain stores do not sell this type of bird.

Most broilers are sold whole, and most processors sell broilers in fewer than ten different forms. Broilers are usually sold fresh and kept cool on ice or in refrigerators. Further analysis of the distribution, with diagrams, is found in Chapter III.

II LOCATION ANALYSIS

In this chapter, the location of the broiler producers and broiler processors will be analyzed. The first part of the chapter will deal with the producers, and the second part with the processors.

Location analysis of an economic activity can be carried out in many ways, but in all cases the location of this economic activity is explained in terms of related factors.

The relationship between the economic activity and any one factor can be measured in terms of the degree of association which exists between the two. The measure can be either qualitative or quantitative. Once a relationship is established, attempts can be made to explain the type of relationship. For instance, there may be a direct causal relation between the existence of the one factor and the presence of the economic activity, or the presence of the factor and the economic activity may be the result of a third factor. The type of approach outlined here is used in this chapter to explain the location of the broiler growers and the broiler processors. Both qualitative and quantitative methods are employed.

The broiler industry is a part of the poultry industry, which, in turn, is a part of the agricultural sector of the economy. The existence of agriculture is necessitated by the existence of consumers, who provide the market for the agricultural products, of which the broiler is one product. Hence any explanation of the location of broiler growers has to include references to the poultry industry, agriculture as a whole, and the population.

The spatial pattern of broiler production has been influenced greatly by promotional activities of feed companies and processors, and by availability of potential growers. The over all pattern, however has been determined by more basic factors such as the location of the population and the value of the land used for agriculture.

Collection of Data

Data have been collected at the federal, provincial, producer, and processor level. At the federal level the Dominion Bureau of Statistics has not categorized broiler production as a separate entity of poultry. At the provincial level accurate broiler production data have been kept since 1965 by the Ontario Broiler Chicken Producers' Marketing Board.

The author has gathered, by means of questionnaires, a great deal of additional information on the producer and processor level. (See Appendix). Further insights were gained by visiting processing plants and broiler producers.

Historical Perspective

Ideally, any economic activity, be it a foundry or a poultry farm, is initially started at the optimum location. This location is influenced by such factors as source of raw materials, labour availability, and location of market. Through time any or all of these factors may change in importance. The result is that the optimum location for the economic activity is at a different site. The expense of moving, often causing historical inertia, is the most significant retarding factor in changing location.

From 1951 to 1966, poultry production experienced many changes, which resulted in a new pattern of location. New types of poultry production (broiler growing for instance) resulted in original patterns of location as they were new phenomena. Established types of poultry production, such as raising pullets for egg production, have partly adjusted to a new pattern. The adjustment has not been complete because of historical inertia.

To gain insight into the changing pattern of poultry production, the percentage adjusted change from 1951 to 1966 will be calculated on a county or regional basis for Ontario, using data on:

(a) total hens and chickens,[1]

(b) pullets six months and over kept for laying,[2]

(c) population.[3]

The percentage adjusted change is calculated in the following manner:

$$\frac{1966 - (1951 \times d)}{1951 \times d} \times 100\% = \text{percentage adjusted change/county}$$

$$d = \frac{1966}{1951} \quad \text{for the whole province}$$

For instance, in the case of population, $d = \frac{6,960,870(\text{Pop. in } 1966)}{4,597,542(\text{Pop. in } 1951)}$

$$d = 1.514$$

The percentages adjusted change are found in Table 4.

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[1] Census of Canada, 1951, IV, "Agriculture, Ontario" (Ottawa: The Queen's Printer), table 31. Census of Canada, 1966, Ibid., table 18.

[2] Ibid.

[3] Census of Canada, 1951, I, "Population", table 2. Ibid., 1966, table 7.

TABLE 4

POPULATION, HENS AND CHICKENS, AND PULLETS SIX MONTHS AND OVER, KEPT FOR LAYING; TOTAL NUMBER, AND PERCENTAGE ADJUSTED CHANGE, 1951-1966.

County Name	No.	Population 1966 '000	Population '51-'66 % change	Hens & Chickens 1966 '000	Hens & Chickens '51-'66 % change	Pullets 1966 '000	Pullets '51-'66 % change
Brant	1	91	-17.6	349	-20.2	105	-25.2
Elgin	2	63	-25.2	381	-28.2	223	+ 4.9
Essex	3	281	-14.6	482	-25.6	202	-15.9
Haldim.	4	30	-17.9	606	+ 8.3	153	-11.5
Kent	5	96	-19.5	660	-31.7	273	-17.2
Lambton	6	108	- 4.6	891	-33.6	430	- 8.4
Lincoln	7	146	+ 8.0	1939	+380.4	125	+19.8
Middles.	8	249	+ 1.6	1304	+14.2	834	+85.7
Norfolk	9	51	-21.8	613	+50.2	126	- 9.2
Oxford	10	76	-14.6	927	-11.6	320	-11.8
Welland	11	179	- 4.2	781	+203.3	166	+90.5
Wentwt.	12	394	- 2.1	1085	+54.2	173	+15.4
Bruce	13	43	-31.1	537	-23.3	172	-36.9
Dufferin	14	17	-22.4	299	-31.6	89	-34.8
Grey	15	63	-29.9	627	-20.8	211	-32.7
Halton	16	141	+111.3	651	+22.2	189	+28.2
Huron	17	54	-27.0	1889	+24.3	625	+23.3
Peel	18	172	+104.4	190	-60.6	51	-64.3
Perth	19	60	-25.5	1533	+22.0	479	- 2.1
Simcoe	20	149	- 7.5	715	- 8.1	263	+ 9.6
Waterl.	21	217	+13.5	1441	+39.5	391	+28.4
Welling.	22	94	- 7.1	1668	+53.9	335	+ 2.3
Durham	23	45	- 2.3	431	+ 4.1	107	-27.0
Hastings	24	94	-16.3	147	-51.2	74	-33.9
Northum.	25	45	-11.1	501	- 6.7	162	-10.7
Ontario	26	171	+29.6	487	-18.5	217	+ 8.3
Peterb.	27	82	-11.1	294	-18.3	64	-53.8
Pr. Edw.	28	21	-24.2	244	-33.2	62	-20.5
Victoria	29	31	-24.7	196	-38.3	72	-36.9
York	30	2018	+13.3	851	- 2.6	224	-18.7
PROVINCE		6961	1.514	25309	1.065	6838	1.241
E. Ont.	31	876	- 5.3	2114	-40.6	1283	+ 6.7
N. Ont.	32	740	-18.0	436	-52.7	286	-30.5

Source: Census of Canada, 1951, 1966.
Values of d underlined.

Shifts In Population

During the 15 year period of 1951 to 1966, the population of Ontario has grown 51.4 per cent. The increase has not taken place evenly throughout the province, and the percentage adjusted change measures the deviation from the provincial growth rate. (Fig. 5).

From 1951 to 1966 the population growth has been strongest around the two largest metropolitan centres, Toronto and Hamilton, and in counties containing medium sized centres, such as Waterloo, Middlesex, Carleton, and to a lesser extent Essex County. The population growth rate has been much slower in the rural counties, away from the urban centres such as: Bruce, Grey Huron, Victoria and Prince Edward.

Shifts In Poultry

Partly because of the shift in population, partly because of changed technology and transportation, the growing of poultry has become more concentrated in Southwestern Ontario. Total hens and chickens have increased only 6.5 per cent in Ontario in the fifteen year period, but their production location has changed considerably. This change was caused partly by the switch from many small farm flocks to large specialized flocks. Present specialized flocks contain approximately twenty thousand birds, the three most important types being: pullets up to six months, pullets kept for laying, and broiler chickens. Broiler flocks accounted for about 37.5 per cent of all hens and chickens in the

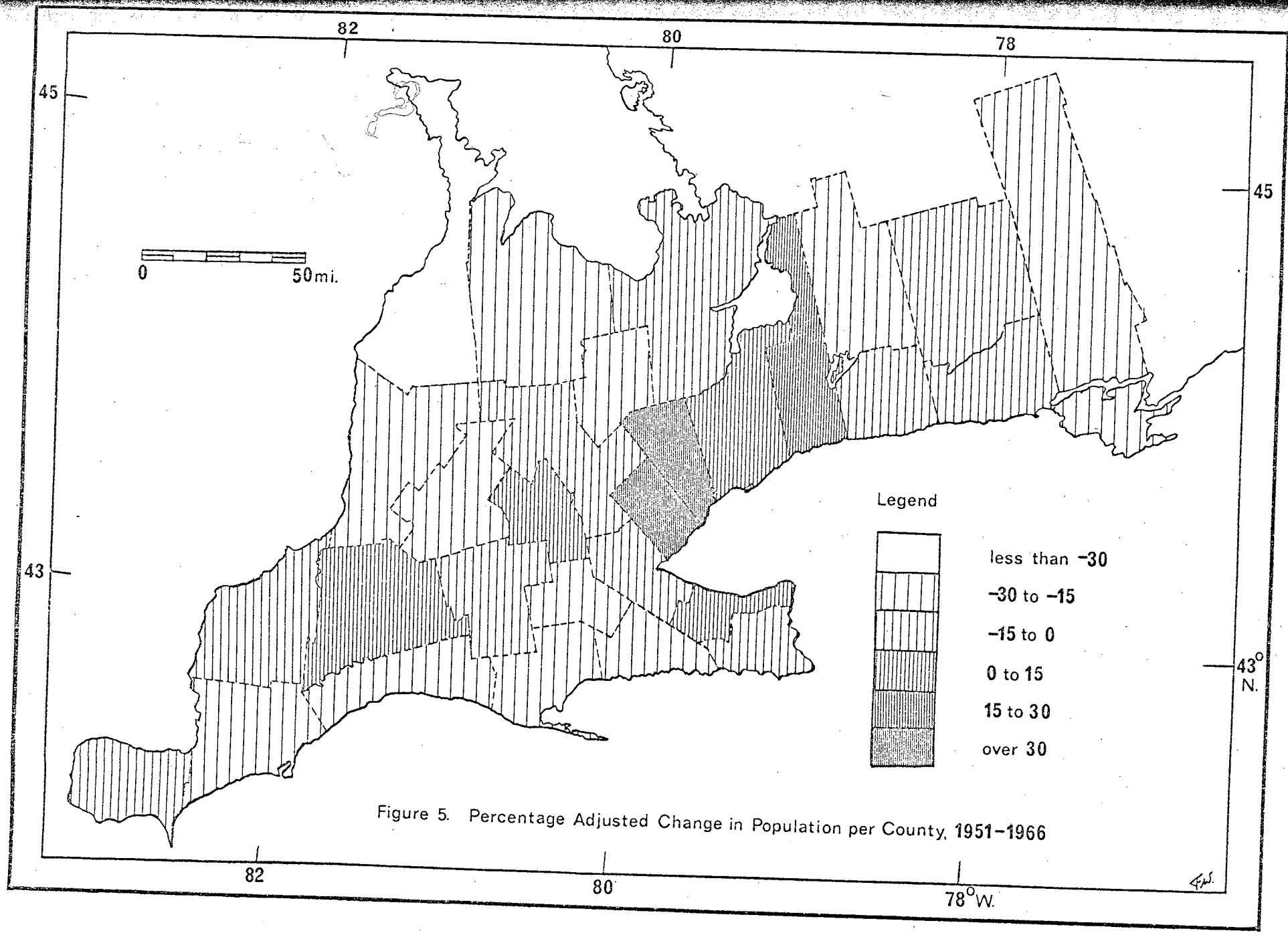


Figure 5. Percentage Adjusted Change in Population per County, 1951–1966

year 1966,[4] while in the year 1951 they constituted about 4 per cent of the total. Hence the change of location of hens and chickens partly reflects the present location of the broiler production (Fig. 6).

To show that broilers were not solely responsible for the shift in location, the pullets kept for laying purposes have been analyzed separately (Fig. 7).

The patterns of change for pullets and hens and chickens (Figs. 6, 7) are fairly similar. A sharp decrease in pullets and hens and chickens is found in two groups of counties. The first group is far removed from the Toronto-Hamilton-Niagara area, while the second group centers around York County (Toronto). Large increases in numbers of pullets and hens and chickens are found in counties with medium sized urban centres[5] (Wentworth, Waterloo, Lincoln and Middlesex), and in counties contiguous to these (Welland, Halton, Wellington, Perth, Huron).

Summary Of Historical Change

A more visual comparison of the shift in population and the shift in poultry is found in graphs (Figs. 8, 9). In these graphs the percentages adjusted change for each county is plotted. Figure 8 shows the re-

[4]Ontario Broiler Board, Third Annual Report, 12. From June 4 to September 4, 1966, 13,952,000 broilers were processed. Average life of a broiler is nine weeks, and with one broiler crop every thirteen weeks gives $\frac{9}{13} \times 13{,}952{,}000 = 9{,}657{,}000$ broilers on June 1, 1966. This is 37.5 per cent of all hens and chickens.

[5]Medium sized cities have between 100,000 and 500,000 people. Cencus of Canada, 1966, I, "Population", Appendix B.

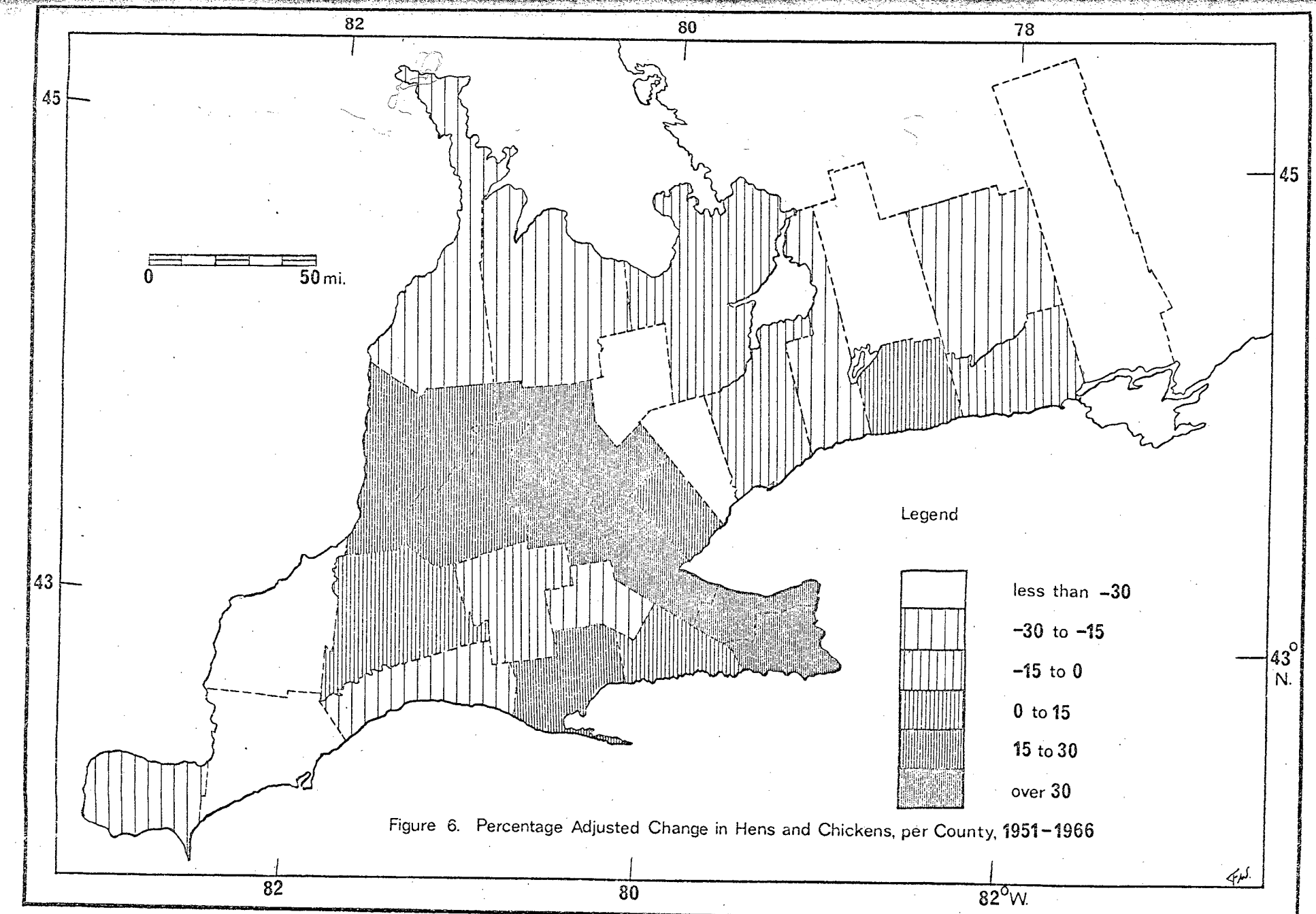


Figure 6. Percentage Adjusted Change in Hens and Chickens, per County, 1951–1966

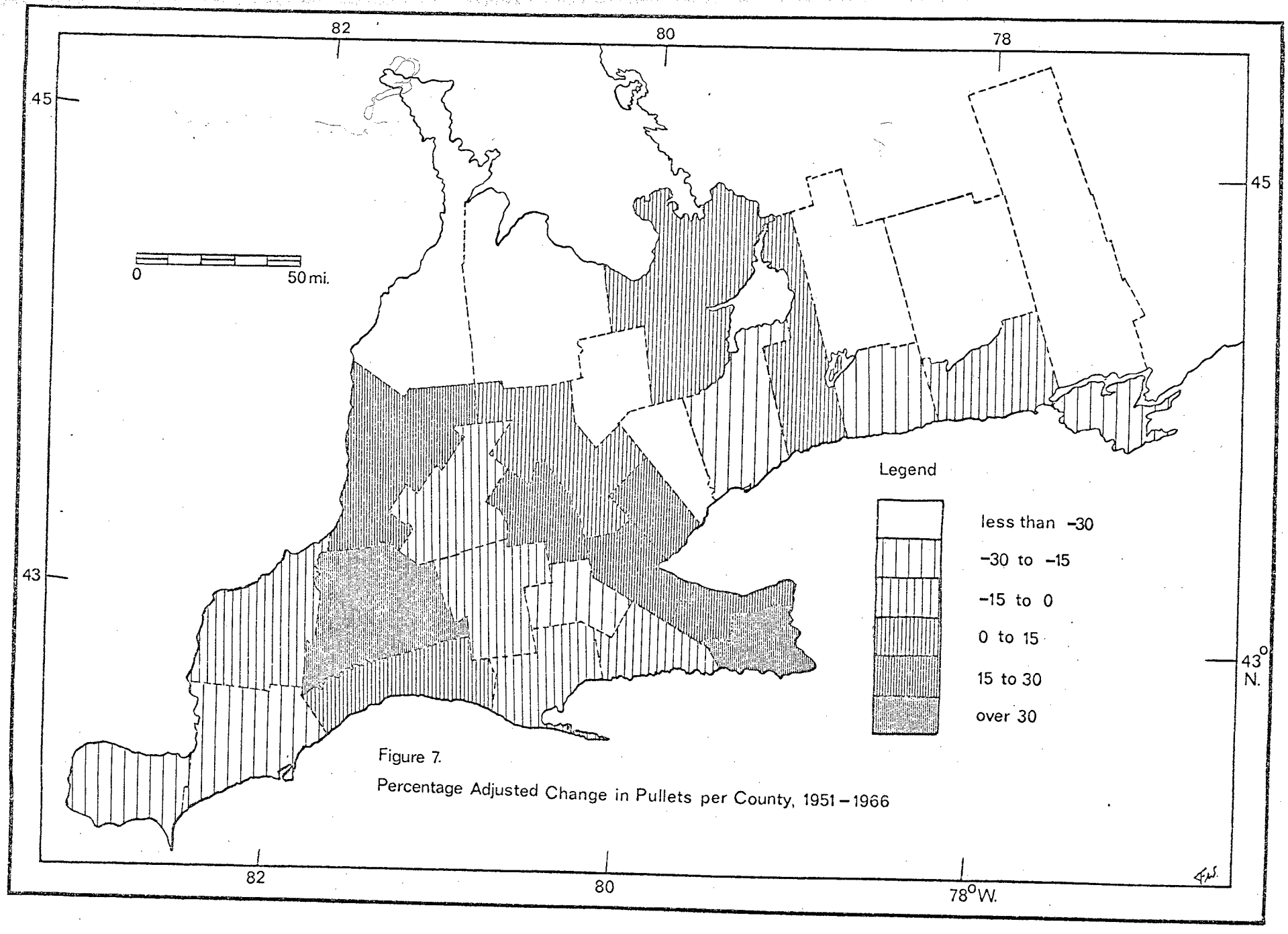


Figure 7.

Percentage Adjusted Change in Pullets per County, 1951 – 1966

lative change in population versus the relative change in hens and chickens, while Figure 9 shows the same using population and pullets. Both graphs show similar patterns, and the following conclusions may be drawn from them.

1. Counties removed from the heart of Southern Ontario (Toronto-Hamilton-Kitchener-Niagara Falls) show a relative decrease in population, but a greater relative decrease in hens, pullets, and chickens. Examples are the counties of Kent, Lambton, Bruce, Grey, Dufferin, Victoria, Hastings, Prince Edward, and Peterborough.

2. Counties with a high population growth and a high population density show only a small relative increase, or a decrease in hens, pullets, and chickens. Examples are the counties of Peel, York, and Ontario.

3. Counties in between these two groups may be called 'suburban' counties. The population growth rate is variable, and they contain medium sized urban centres or are adjoining to counties with such urban centres. In these counties, the poultry population has increased rapidly. These counties are: Lincoln, Welland, Middlesex, Waterloo, Wentworth, Wellington, Perth, and Huron.

Relation Between Location Of Population And Poultry

The following hypothesis suggests itself:

> An increase in population in an area is preceeded by an increase in poultry production, especially broiler production.

When a city expands in size and population, the surrounding area has to produce more poultry. City expansion causes higher land values and increased land speculation around the cities. Fears of urbanization

Fig.8. Change in Population versus Change in Hens and Chickens 1951 - 1966.

For County numbers, see Table 4.

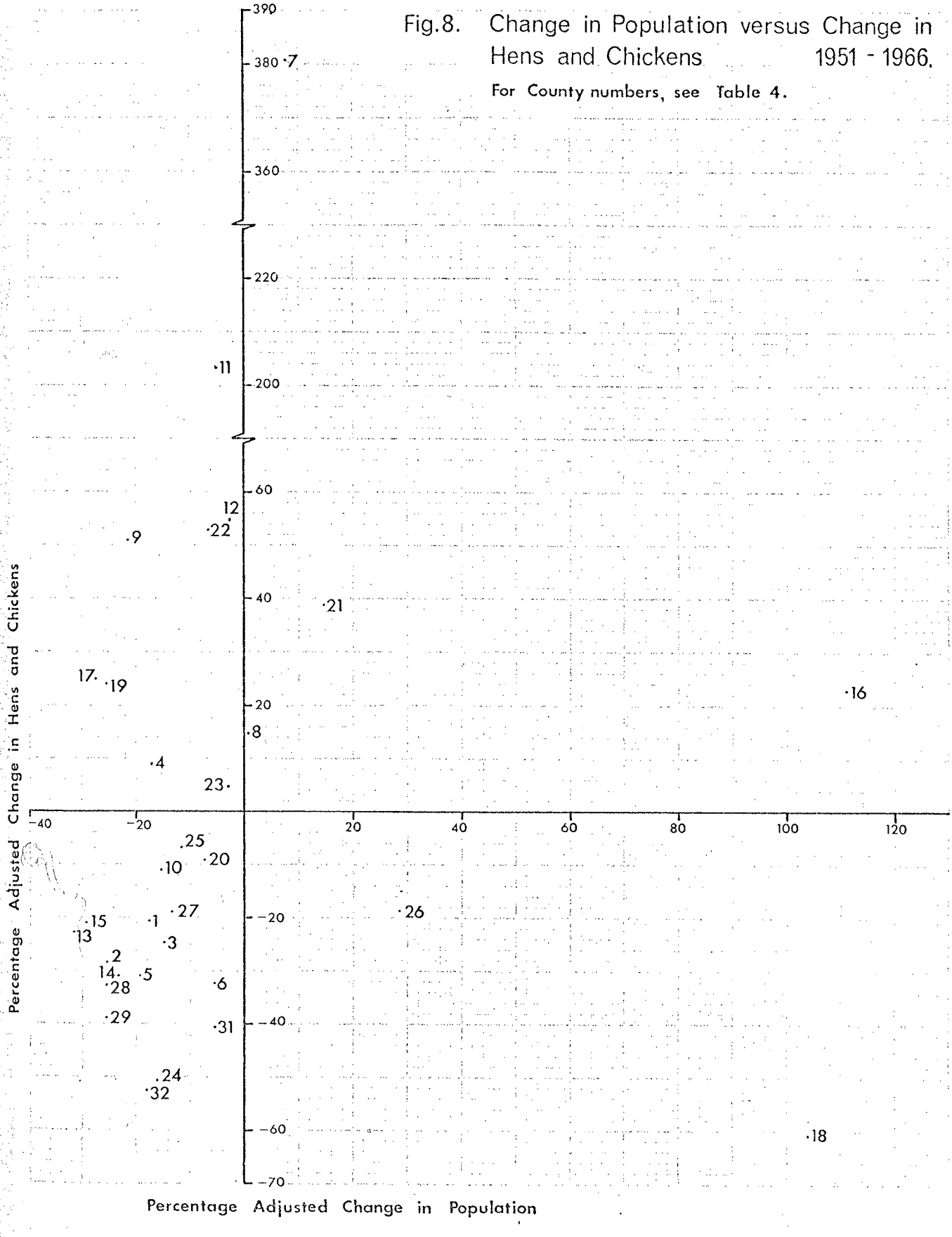
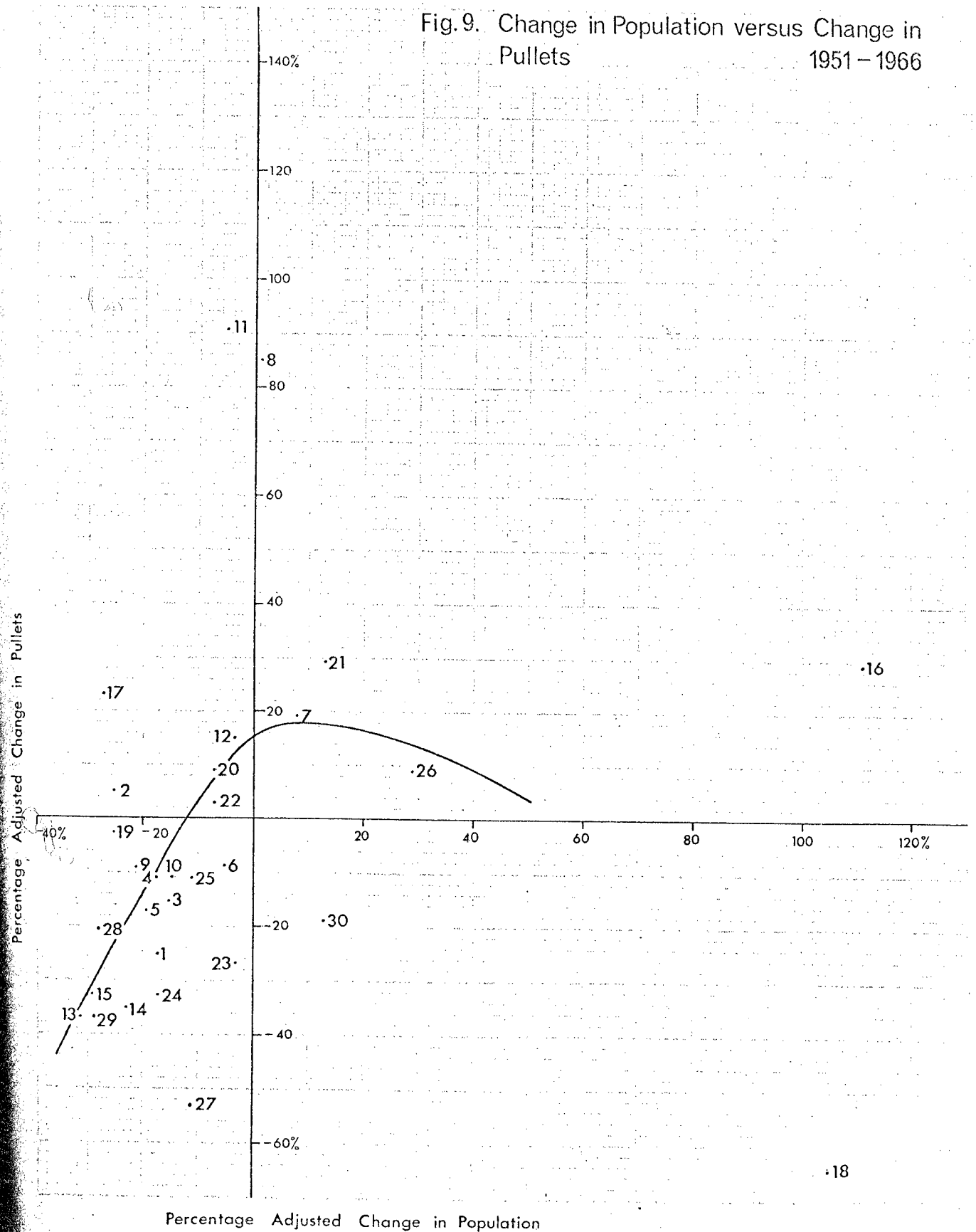


Fig. 9. Change in Population versus Change in Pullets 1951 – 1966



will discourage long term agricultural investments around the city and give way to short term investments.[6] Raising poultry requires a medium to short term investment. Pullets are kept one year, turkeys shorter, and broiler chickens about two months. All other factors being equal, broiler production can take place closest to the city, while pullets are expected a little further from the city. If the city expands further, even broiler growing becomes unprofitable (because of high land rent), or impossible (because of city by-laws). The result will be a wavelike movement away from the heart of the city, first population, then broilers, then pullets.

Of course many other factors are involved. One such factor which has played and still does play an important role is the change in technology. Poultry growing has changed from "No farm yard should be without poultry"[7] to having poultry houses of which "Some are three stories high" which "house as many as 40,000 to 50,000 birds for every working man."[8] This greater density, coupled with great genetic improvements giving faster rate of gain, have enabled poultry growers to make greater use of an acre of land, and hence have made them better competitors with other land users around the city. If the broiler densities and feed efficiency increase, and the broiler cycle becomes shorter yet, then, in the future, broilers will be found still closer to the city, assuming

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[6]Robert Sinclair, "Von Thünen and Urban Sprawl", Annals of the Association of American Geographers, LVII, 1 (March, 1967), 81.

[7]Duncan Marshall, Field and Farm Yard: filling soil and breeding lifestock (n.p., Imperial Oil Ltd., Canada, 1929), 114.

[8]Higbee, Farms and Farmers, 28.

other factors such as transportation costs and land values to be constant.

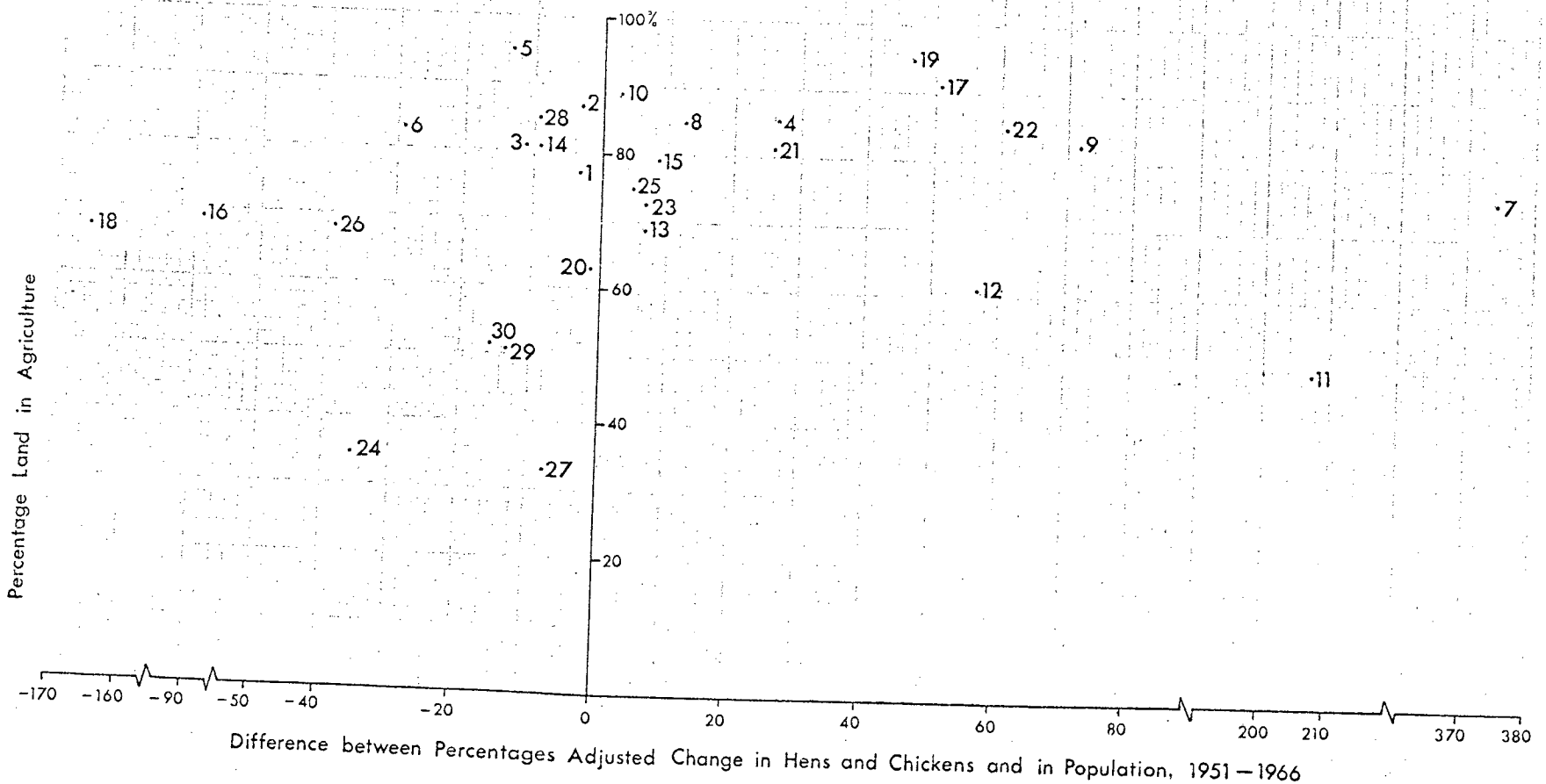
Population, Hens And Chickens, And Agricultural Land

What we have then is an increase in population, preceeded by an increase in poultry, followed, of course, by a decrease in poultry in any one area where extensive urbanization takes place.

If one takes the percentage adjusted change in hens and chickens as calculated, and subtracts from it the percentage adjusted change in population, the difference will reveal which of the two, hens and chickens or population, has increased most or decreased least in each county (Fig. 10). A positive value for a county indicates that hens and chickens have increased more than population. This means, according to the hypothesis, that this county is being urbanized. If the county value is negative, there are two possibilities. Either the county is strictly rural, and will remain so in the near future, or the county is becoming so highly urbanized that poultry production is discouraged. The negative values for the rural counties are caused by technology giving rise to larger and more specialized farms, which are usually located close to urban areas. The values are plotted against the percentage land in agriculture.[9] The numbers on the graph correspond to the numbers given to the counties in Table 4. The range on the horizontal axis is 540 per cent, and one-third of the county values are between +10 per cent and

[9] Census of Canada, 1966, Bulletin S-202, Table 3.

Fig. 10. Relation between Population, Hens and Chickens, and Land in Agriculture.



-10 per cent.

Counties to the right of +10 per cent are the 'suburban' counties. The only exception is Norfolk County (No. 9) whose presence can be explained under capital investment in agriculture. The percentage land in agriculture in a county decreases when urbanization increases. This means that counties which are highly urbanized have a low percentage land in agriculture. Judging from the graph, the most highly urbanized county seems to be Peterborough. However, as a result of the presence of the Canadian Shield in Peterborough, Victoria, and Hastings counties, their values cannot be used to measure the extent of urbanization.

The following observation can be made regarding the remaining counties. Moving from left to right across the graph the percentage land in agriculture first increases, and then decreases. Seeing this information in the light of the hypothesis, it can be said that the counties on the right side of the graph are becoming urbanized but their growth in population has not as yet caught up with the growth in hens and chickens. Similarly, counties on the far left side of the graph are so rapidly becoming urbanized that the population is growing faster than the hens and chickens. The latter counties are less important agriculturally than the former ones.

Population Density

The hypothesis is:

> An increase in population is preceeded by an increase in poultry, followed by a decrease in poultry where extensive urbanization takes place.

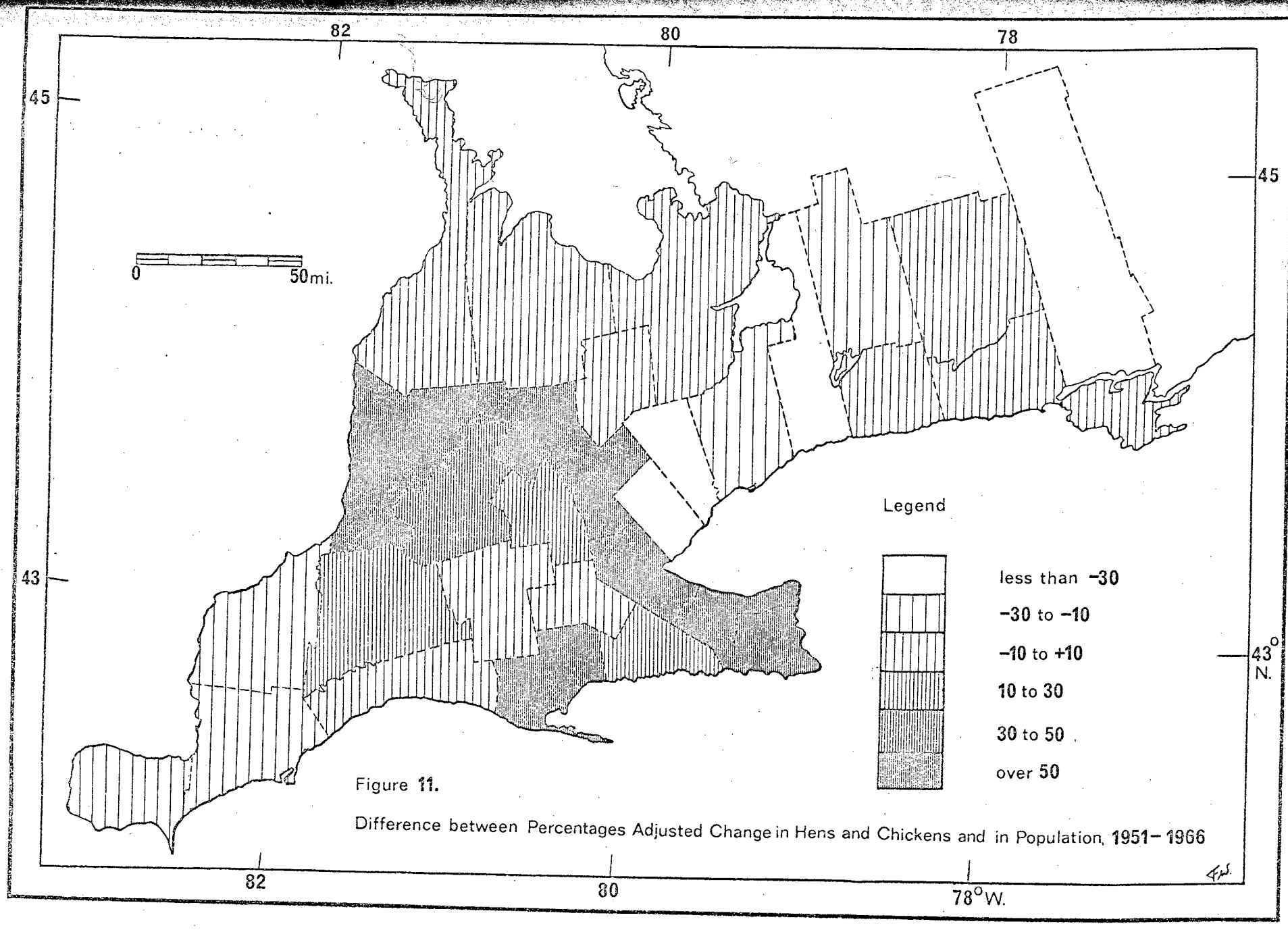


Figure 11.

Difference between Percentages Adjusted Change in Hens and Chickens and in Population, 1951–1966

To further test this hypothesis, population density can be correlated with the present location of poultry. The following types of poultry will be used: broiler chickens, turkeys[10], and pullets six months and over kept for laying. Broilers, turkeys, and pullets have many things in common which make it possible to group them and to compare them with each other:

1. Their production is three steps away from the consumer: In the case of broilers and turkeys, the three steps are processing plant, retailer, and consumer. In the case of pullets, the eggs are graded, then retailed, and then consumed.

2. The degree of knowledge needed by the producer is similar, because all three are in the last live stage, and all the breeding and selection has taken place beforehand.

Because of these similarities, a prospective poultry grower can choose any one of these three types of poultry equally well. His choice will, to a large extent, depend upon local custom, local opportunities, and personal preference. Both Bowden[11] and Hägerstrand[12] have shown that in the adoption of a new farming practice, local presence of the practice plays a most important role.

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[10] Ibid., IV, Table 18.

[11] Leonard W. Bowden, Diffusion of the Decision to Irrigate, Simulation of the Spread of a New Resource Management Practice in the Colorado Northern Plains (Chicago: The University of Chicago Press, 1965), 92-98.

[12] Torsten Hägerstrand, "On Monte Carlo Simulation of Diffusion," in Quantitative Geography, I: Economic and Cultural Topics, ed. by W.L. Garrison and D.F. Marble (Evanston, Ill.: Dept. of Geography, Northwestern University, 1967), 1-7.

The total number of people entering poultry production in any one area is determined largely by economic factors. Under any set of economic conditions, a limited number of people will enter poultry production. Assuming the same returns for all three types of poultry, it can be said that the sum of producers of broilers, turkeys, and pullets reflect accurately the economic conditions for growing poultry in that area or county.

The sum of producers is translated into the average number of broilers, pullets, and turkeys in the following manner. The area under consideration, Southwestern Ontario, is taken to be 100 per cent. The percentages of broilers, turkeys, and pullets are calculated for each county. The percentages for each county are added and divided by three to gain the average percentage of all three. The total number of turkeys, broilers, and pullets is estimated at 20.5 million. In this manner the number of birds per acre improved land[13] in each county is calculated. Some justification for the above calculation is needed since there are a few more broilers than pullets, and twice as many pullets as there are turkeys. Broilers and pullets are about the same size, and their products, although different, are similar in monetary value per time unit. Moreover, the average size of a production unit is similar for each. Turkeys are at least twice as heavy and need at least twice the space of broilers and pullets. For these reasons, it

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[13]Census of Canada, 1966, Bull. S-202, Table 3.

was felt justifiable to average the percentages of broilers, pullets, and turkeys in each county, in the described manner.

Poultry raising is equated with the raising of broilers, pullets, and turkeys because these three types constituted 74 per cent of all poultry in Ontario, and 76.2 per cent in Southwestern Ontario. In Southwestern Ontario, the remaining 23.8 per cent comprises breeding flocks, roasters, cockerels, pullets under six months, and a few ducks and geese.

TABLE 5

SIZE OF BROILER, PULLET, AND TURKEY PRODUCTION, AND TOTAL POULTRY PRODUCTION, IN ONTARIO AND S.W. ONTARIO, JUNE 1, 1966.

Category	Ontario	S.W. Ontario	S.W. Ont. as % of Total
Total Poultry	29,550,000	26,940,000	91.2
Broilers	32.6%	35.6%	99.0
Pullets	27.7%	25.7%	81.5
Turkeys	13.7%	14.9%	98.9

Sources: Census of Canada, 1966;
Third Annual Report, 1967

This analysis will only cover Southwestern Ontario, because it contains 99 per cent of all the broiler production and 100 per cent of the broiler processing facilities.

The densities of broilers, pullets, and turkeys in each county are expressed in number of birds per acre improved land (Table 6). Attempts to correlate these densities with population density were not significant at all. For this reason, a different measure of population density has been devised.

Demand for poultry and poultry products is related to population density. Above, it has been shown that this demand is reflected not only in the county containing a large population, but also in the surrounding counties. Therefore, in a correlation analysis of population and poultry densities, the population density measure of one county should reflect the population densities of the neighbouring counties. The formula expressing this population density measure is:

$$D' = D_c + \frac{\Sigma D_s}{2} k$$

D' = Population density measure.

D_c = Population density of the county in question.

ΣD_s = Sum of the population densities of the surrounding counties.

k = one, as long as the surrounding counties number four or fewer.

If there are six surrounding counties, $k = \frac{4}{6}$.

If there are five surrounding counties, $k = \frac{4}{5}$

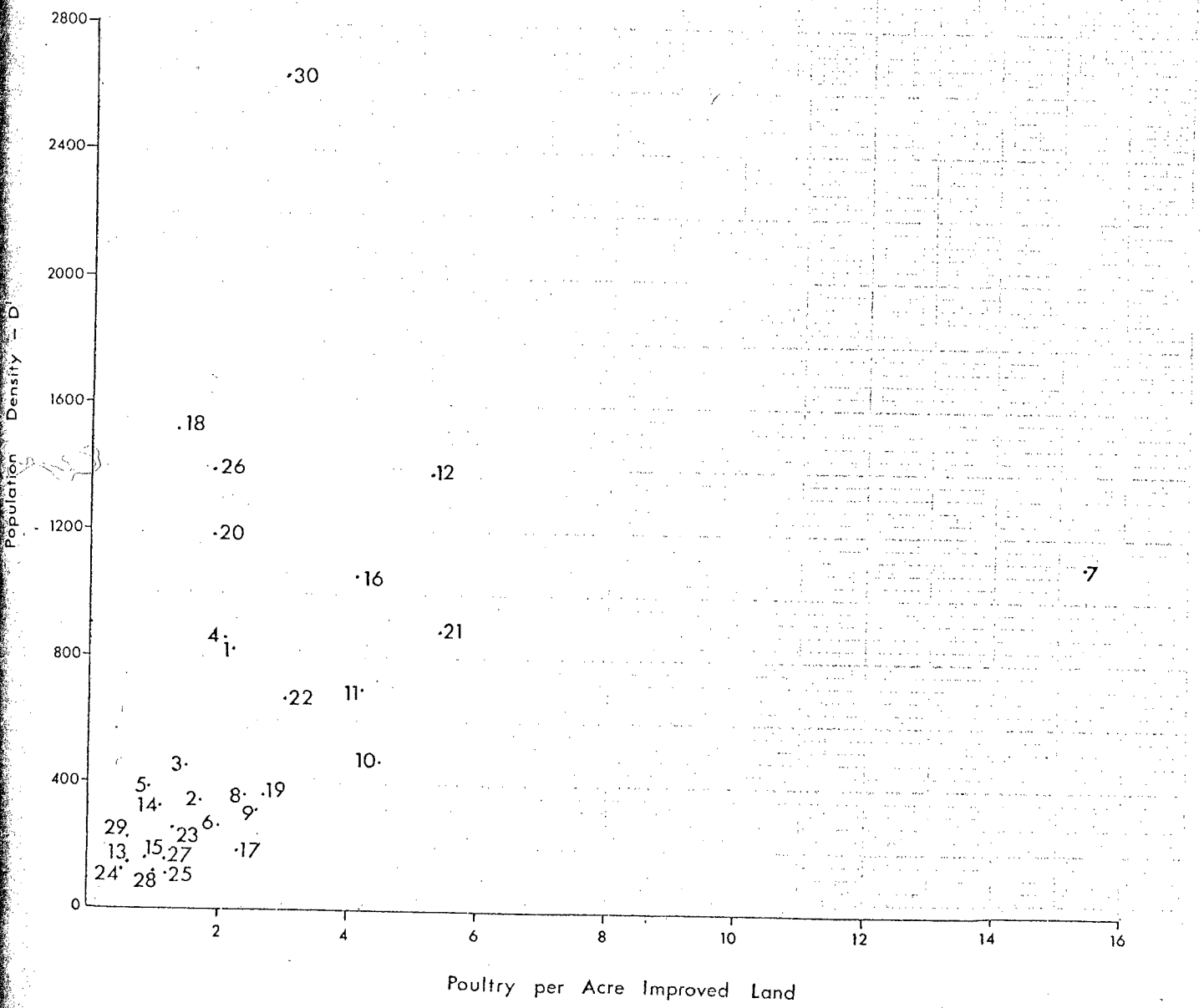
The formula takes into account the isolation of a county, while the k factor rectifies the irregular shape of a county. Two extreme examples are Essex and Wellington. Essex is isolated, and Wellington

Table 6

DENSITY MEASURES OF SELECTED POULTRY PRODUCTION, CAPITAL INVESTMENT IN COMMERICAL FARMS, AND POPULATION.

County Name	No.	Birds/acre improved land				Cap. Inv. per acre $	$D_c + \frac{\Sigma D_s}{2}$ k
		broiler	pullet	turkey	Ave.		
Brant	1	1.7	.6	.5	2.2	515	825
Elgin	2	.5	.7	.5	1.7	465	338
Essex	3	.3	.6	.5	1.5	597	450
Haldim.	4	1.1	.6	.5	2.1	259	874
Kent	5	.2	.5	.2	.9	545	394
Lambton	6	.2	.9	.6	2.0	319	249
Lincoln	7	14.4	.9	4.9	15.4	854	1102
Middles.	8	.2	1.5	.5	2.4	373	359
Norfolk	9	2.5	.5	.6	2.6	792	312
Oxford	10	1.0	.9	1.1	4.5	484	457
Welland	11	5.5	1.6	0.1	4.2	370	698
Wentwt.	12	7.4	1.2	.6	5.3	514	1389
Bruce	13	.7	.3	--	.6	230	147
Dufferin	14	.8	.4	.2	1.1	266	322
Grey	15	.8	.4	.1	.9	217	157
Halton	16	3.9	1.6	.5	4.1	580	1043
Huron	17	1.9	1.0	.4	2.3	299	192
Peel	18	.7	.3	.4	1.3	536	1517
Perth	19	2.3	1.0	.4	2.7	279	365
Simcoe	20	1.1	.5	.5	1.9	309	1184
Waterloo	21	4.4	1.7	1.1	5.4	523	897
Wellingt.	22	3.2	.7	.5	3.0	326	641
Durham	23	1.6	.5	.1	1.3	313	242
Hastings	24	.3	.3	--	.5	189	149
Northum.	25	1.0	.7	--	1.2	258	124
Ontario	26	1.9	.8	.1	1.9	370	1391
Peterb.	27	1.6	.4	--	1.2	205	142
P. Edw.	28	1.2	.4	--	1.0	216	106
Victoria	29	.5	.3	--	.6	200	203
York	30	3.1	.9	.4	2.9	566	2614

Fig. 12. Relation between Population Density and Poultry Density 1966



is surrounded by eight counties.

$$\text{Essex } D' \text{ value} = D_{Essex} + \tfrac{1}{2}D_{Kent}$$

$$= 450$$

$$\text{Wellington } D' \text{ value} = D_{Wellington} + \frac{\Sigma 8\ D_s}{2} \times \frac{4}{8}$$

The D' value are found in Table 6, while in Figure 12 the D' values are plotted against the number of broilers, pullets, and turkeys per acre improved land.

It can readily be seen that York and surrounding counties do not conform to the pattern, because of the high population density of York County. Therefore, in the correlation analysis, these four counties, York, Peel, Ontario, and Simcoe will be left out (Table 7). An additional correlation analysis including all thirty counties will be performed to check the influence of the D' values of York, Peel, Ontario, and Simcoe counties on the degree of correlation.

The sum of the densities per acre improved land for turkeys, pullets, and broilers, does not equal their calculated average density for two reasons. Firstly, the average has been calculated to measure the number of people employed in poultry. Description of the calculation can be found on pages 39 and 40. Secondly, the pullet density and turkey density have been arrived at by using the Census of Canada data, while for the broiler density, the actual square footage allotted per county by the Ontario Broiler Board has been used. The allotted square footage is higher than the actual number of broilers grown at any time, because of the quota system and barn cleaning operations. This differ-

ence does not affect the correlation analysis, however, for only linear correlation is measured, but it does give a broiler density which is higher than it is in reality. The results of the correlation analysis, lead to the following observations (Table 7):

1. Using twenty-six counties (all except Peel, York, Ontario, and Simcoe), the correlation between poultry raising and population as measured by the formula, is highly significant. Using Fisher's t[14], the chance of finding such a close relation is less than one time out of a hundred. This means that the results are significant at the 99 per cent level.

2. Using all thirty counties, the correlation between population and poultry becomes much less significant, so much less in fact that only the broiler production shows a significant correlation with population at the 95 per cent level.

This loss in correlation can only be attributed to the four counties of Peel, York, Ontario, and Simcoe. These counties have a high population density measure, combined with a relatively low poultry density. The difference between the above two analyses points out that the highly significant correlation between poultry growing (turkeys, broilers, and pullets) and population does not hold for York and surrounding counties. To state this more generally, the highly significant correlation between poultry and population does not hold in or next to regions with a very high population density.

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[14] S.B. Richmond, Principles of Statistical Analysis (New York: The Ronald Press Company, 1957), Table IV.

Capital Investiment in Agriculture

The type of agriculture found in any region does not only depend upon population density. Prevalent soil and climatic conditions greatly influence the farmer's choice of type of agriculture. Because of soil and climate, the region north of the Niagara Escarpment in Lincoln County is used for growing fruits, the Holland Marsh area is used for vegetables, and Kent County is used for growing cash crops.

Since poultry raising requires no special soil conditions, and since outside climate has little effect inside the buildings, except on the heating bill, poultry can be grown quite irrespective of soil and climatic conditions. Yet soil and climate contribute to the value of the agricultural land.

The land value will be a factor influencing the farmer's decision whether or not to grow poultry. This means that indirectly soil and climatic conditions do influence the poultry production pattern, namely through land values. To measure the influence of land values on poultry production, correlation analysis will be used once again. Unfortunately, agricultural land values, on a county basis, are unobtainable, and local values are unreliable. The next best alternative, it has been felt, is the capital investment per acre. High value agricultural land can only stay in agriculture if it is used intensively. Intensive use of land means high capitalization. Agricultural land of lower value needs less intensive use and less capitalization to give the same returns. Thus capital investment in agriculture is a measure of the agricultural land value, and can be substituted for it. As a matter of fact, capital investment is the sum of the value of the land

and buildings, the value of machinery and equipment, and the value of livestock and poultry.[15]

A very high correlation exists between land value and population density, and there is a high correlation between capital investment and land value. As a result, a high population density tends to coincide with a high capital investment in the surrounding agricultural land. On the other hand, capital investment in agriculture is also influenced by soil and climatic conditions and the anticipation of urbanization.[16]

Therefore poultry raising is not only influenced by the population distribution, but also by the capital investment in agriculture. To find the correlation between poultry growing and capital investment, the author has calculated the correlation coefficients between poultry and capital investment in commercial farms[17] per acre improved land. Capital investment has been restricted to commercial farms only because all broiler growers, the study's primary concern, operate commercial farms (see Tables 6,7 and Figs. 13, 14).

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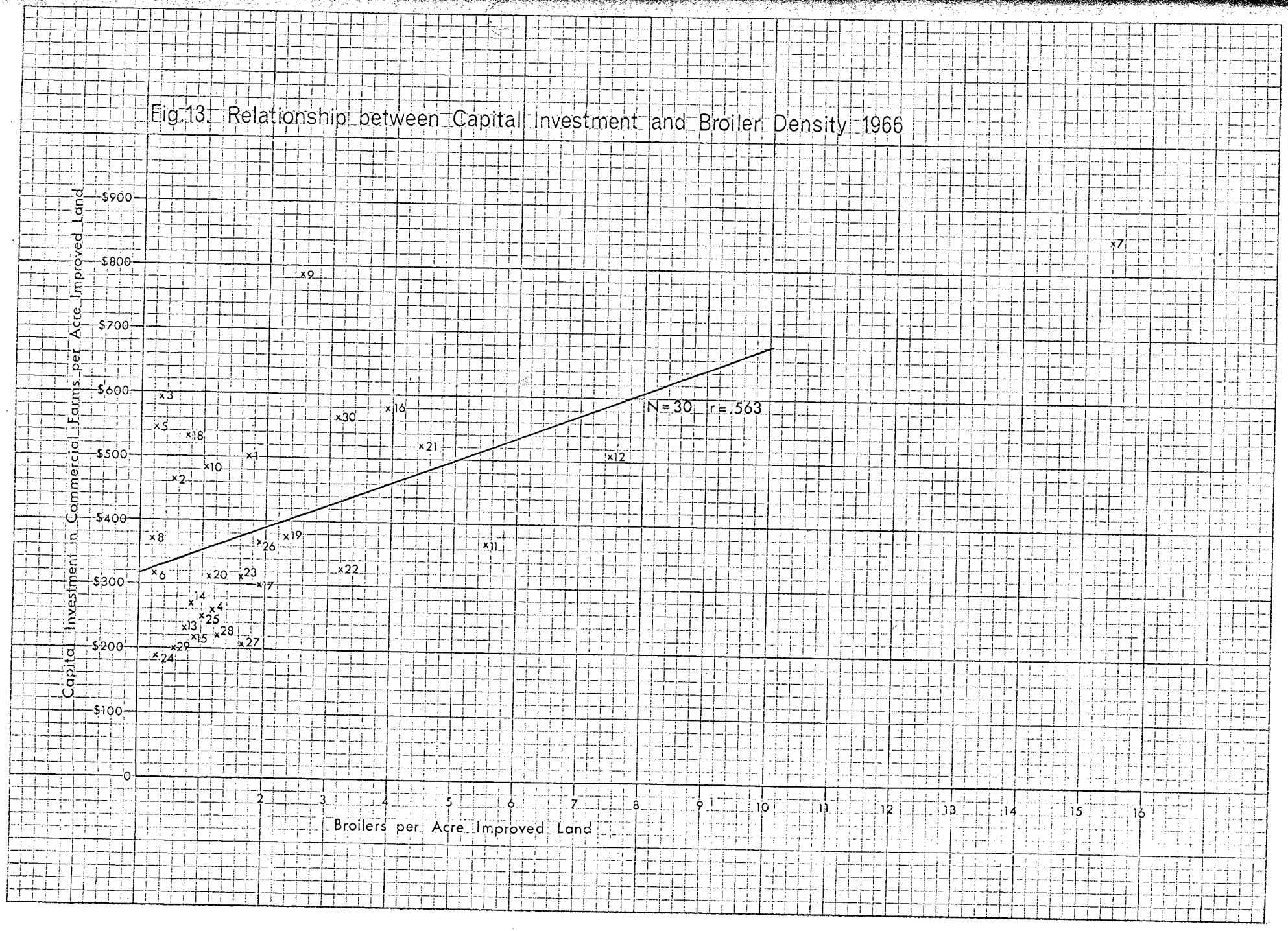
[15] Census of Canada, 1966, IV, Table 18.

[16] Sinclair, "Von Thünen," 81.

[17] Commercial Farm: an agricultural holding of one acre or more with sales of agricultural products of $2,500 or more during the twelve months previous to June 1, 1966.

Fig.13. Relationship between Capital Investment and Broiler Density 1966



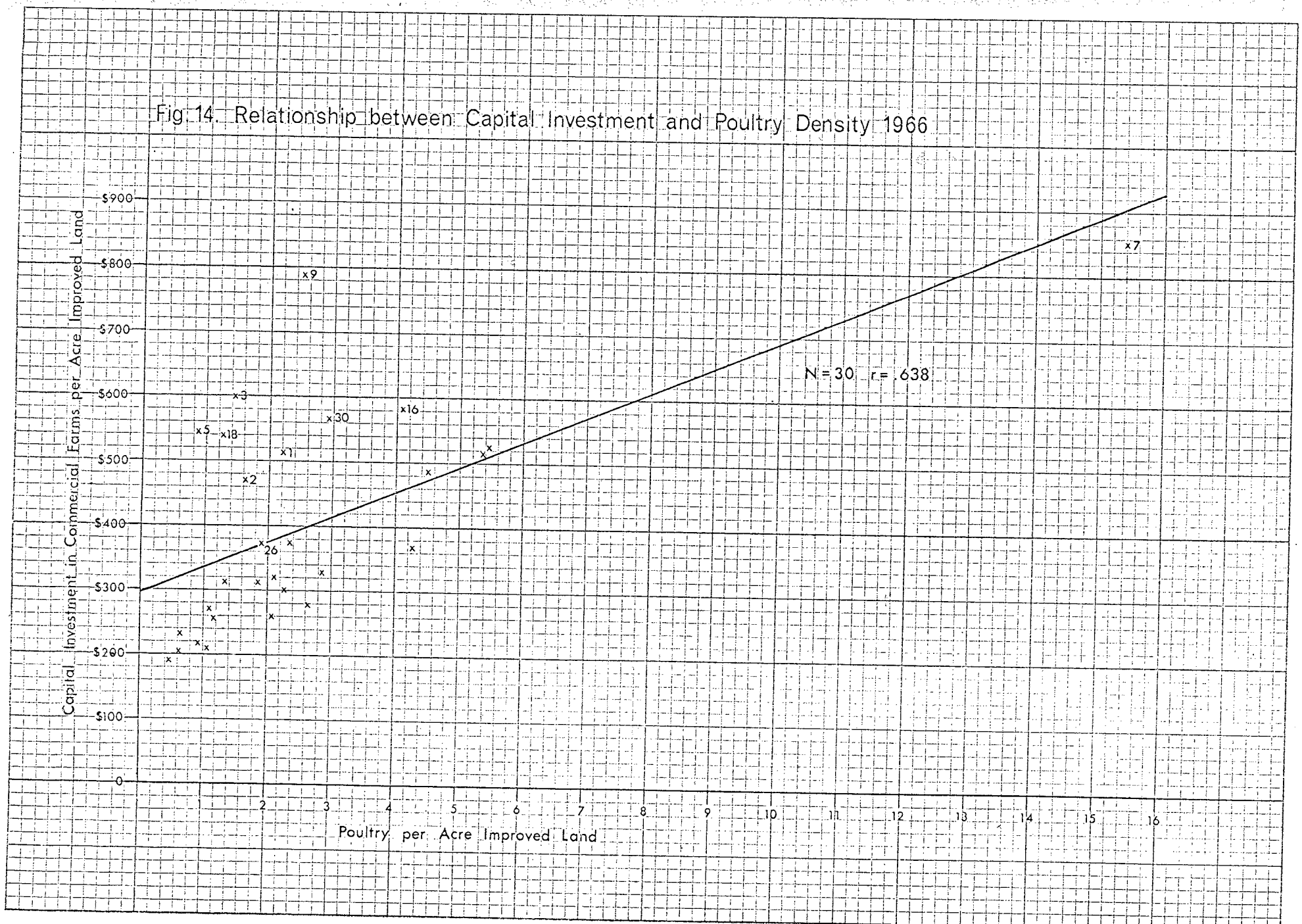


Fig. 14. Relationship between Capital Investment and Poultry Density 1966
Capital Investment in Commercial Farms per Acre Improved Land
$900
$800
$700
$600
$500
$400
$300
$200
$100
0
N = 30 r = .638
Poultry per Acre Improved Land
1
2
3
4
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TABLE 7

RESULTS OF CORRELATION ANALYSIS, SHOWING THE CORRELATION VALUES.

Category	$D_c + \frac{\Sigma D_s}{2} k$	Cap. Investm./acre	$D_c + \frac{\Sigma D_s}{2} k$
Ave. # broilers, pullets, and turkeys/acre	.742**	.638**	.343
broilers/acre	.708**	.563**	.391*
pullets/acre	.576**	.289	.290
turkeys/acre	.546**	.637**	.246
No. counties	26	30	30

* r is significant (95% level of confidence).

** r is highly significant (99% level of confidence).

The correlation between capital investment and poultry is highly significant for broilers, for turkeys, and for the computed average of broilers, turkeys, and pullets. The correlation between pullets and capital investment is not significant.

If broiler and turkey growing were highly capitalized, and constituted a large part of the capital investment in agriculture, the correlation could have been induced by broiler and turkey operations, and as a result, no additional information could be gained from the correlation. After a search of the types and sizes of agricultural investment in several counties, it must be concluded that capital investment for raising poultry in each county of Ontario is less than ten per cent of

the total capital investment.[18] Thus the high correlation between capital investment and poultry is not caused by the capital investment of poultry growers.

Three plausible alternatives are left. Either the size of the capital investment per acre determines the density of the broiler and turkey flocks, or the high correlation between capital investment and broiler and turkey densities is caused by another factor or other factors, or broiler and turkey densities are determined partly by capital investment, partly by other factors. In case of the first alternative, one would expect the distribution patterns of broilers and turkeys to be similar. The patterns are shown in Figure 15. Most of the time, the portions of the circle representing broilers and turkeys are quite dissimilar in size.

Although the second alternative seems possible, in the light of the previous discussion, the last alternative is most plausible: broiler and turkey densities are determined partly by capital investment per acre, partly by other factors. Of these other factors, population density has already been discussed.

The county which best demonstrates the combined influences of high capital investment per acre and a high population density measure is Lincoln County. Since also other factors are involved in Lincoln County, its discussion will be left until the next section.

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[18] Census of Canada, 1966, IV (4-2), Table 22. Ibid., Bull. S-204, Table 16. Ibid., Bull S-207, Tables 8, 9.

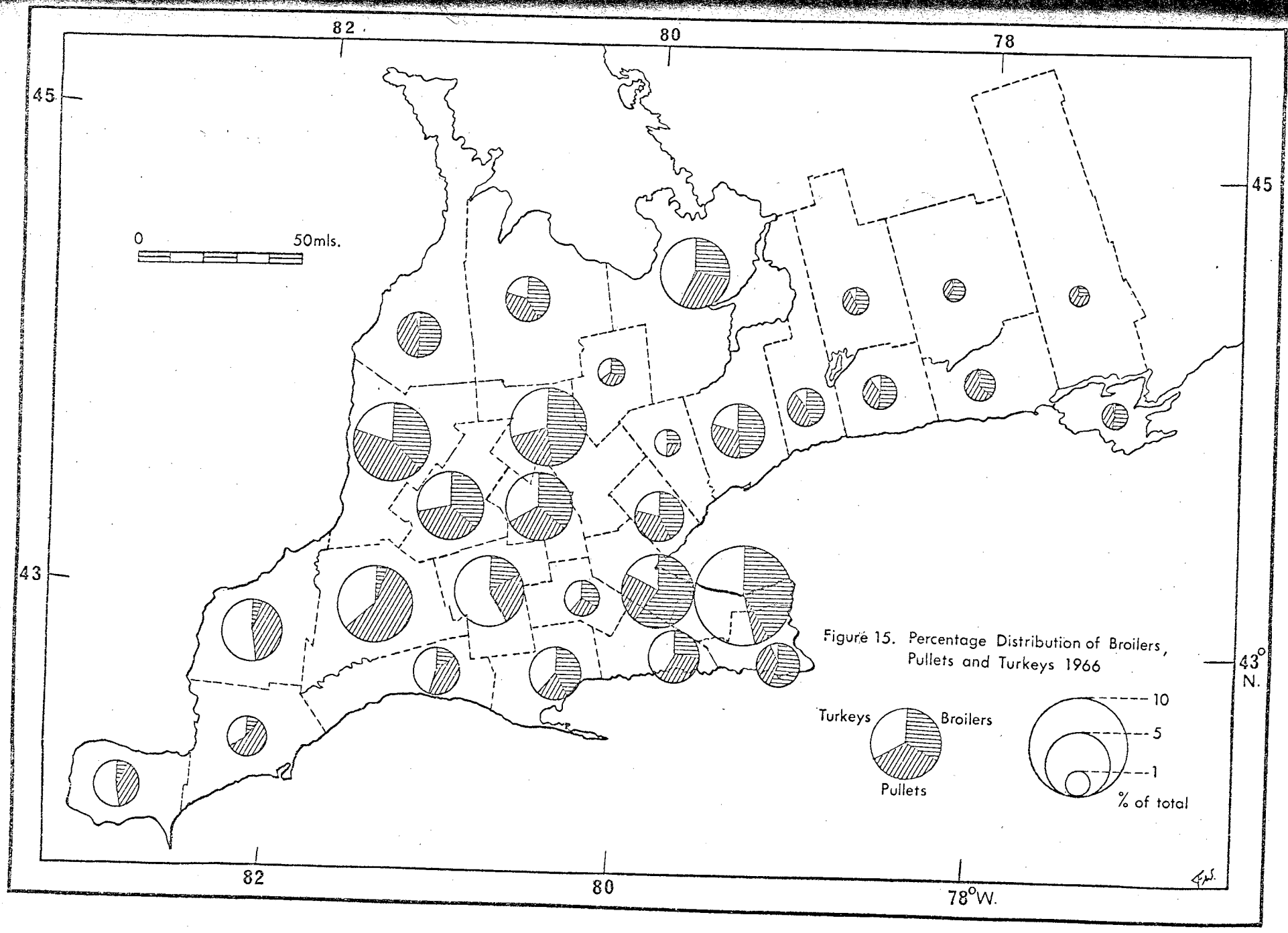

Figure 15. Percentage Distribution of Broilers, Pullets and Turkeys 1966

In Norfolk County a high capital investment per acre in agriculture ($792) and a low population density measure (312) form opposing forces affecting broiler production. In Figure 10, Norfolk is grouped with the 'suburban' counties because its increase in hens and chickens was much higher than its increase in population. Yet it is clearly not a 'suburban' county, but behaves like one because of its high capital investment per acre. Conversely, the broiler density is too low compared to the capital investment (Fig. 13) because Norfolk is quite far from a densely populated area.

Promotion Of Broiler Growing

The seventeenfold rise in broiler output between 1951 and 1966 at the farm level has not been brought about by farmers only. This tremendous growth needed large infusions of capital for buildings, for feed, and for chicks. Some capital was supplied by banks, but more was provided by feed companies, hatcheries, and processing plants. In periods of over-production, some farmers went bankrupt, followed by processors and hatcheries. The company with most credit was, in most cases, the feed company, which integrated the bankrupt companies for protection of its own interests.

Since the beginning of the industry, broilers have been grown under contract. The contractor would guarantee a market for the finished broiler, but not a profit for the farmer. Promotion of broiler growing has depended partly on the locations of the feedmill, hatchery, and processor. The success of the promotion has depended on finding persons who were willing to work hard for a guaranteed, but variable

income.

The town of Clinton, in Huron County, will serve as an example. Broiler growing was promoted by a nearby hatchery and several feed companies. Clinton itself had a processing plant, with other plants in nearby Seaforth and Zurich. Clinton had all the necessities for successful broiler growing, and farmers were encouraged to enter the broiler business. At present, many of the broiler growers are still in the area, though the processing plants are gone and the hatchery is out of the broiler business. Similar examples can be given to explain many of the regional grower patterns. Broilers have made few inroads in Southern Ontario, West of Oxford and Norfolk counties. In this region turkeys have gained prominence instead of broilers, because this region grows grain corn, which is the main staple of the turkey diet. Broiler feed has a highly specialized formulation, and as a result has a stronger competitive position further from the grain growing region of Southern Ontario (see Central Ontario, Fig. 15).

Lincoln County merits closer examination as it has seen a great deal of promotional activities from feed dealers and other interested parties. In Lincoln County, the density of broilers and turkeys is much higher than in any other county. There is a high population density ($D' = 1102$), a deviation in population growth of +8 per cent, and Lincoln's capital investment per acre in 1966 was higher than in any other county ($854). The broilers and turkeys are mostly grown above the Niagara Escarpment, and not in the main fruit belt.

During the late forties and early fifties, this plateau of Lincoln County had many agricultural advantages, the land prices were low ($200 to $300 per acre), it had a good road network, and it was not far from the cities of Toronto and Hamilton. Over and above these advantages, Lincoln County had one of the most pleasing climates in Canada. After World War II, many people immigrated to Ontario, and many immigrant farmers settled here. The Jewish started an agricultural settlement near Smithville, Hungarian refugees moved in after the year 1948. Most of the Dutch came in the 1950's, while the Greeks came in the late fifties and early sixties.

Before mechanization and automation of broiler barns, broiler growing and also turkey growing required a great deal of labour which only the immigrant farmer seemed willing to perform. Since there were many immigrants in Lincoln County, in addition to all the other advantages already mentioned, this county has developed into a broiler and turkey production centre.

Ethnic Groups and Broiler Growing

Many broiler growers in Ontario are post World War II immigrants from the Netherlands. These immigrants have settled in Ontario in clusters (Fig. 16). Other ethnic groups have come to be associated with the broiler industry as well. Unfortunately, at the time of this discovery, the producer questionnaire had already been returned without any information on the ethnic origin of the grower. Upon further investigation it seems that close to half the broiler growers are recent immigrants from Europe. The Dutch alone account for 27.4 per cent of

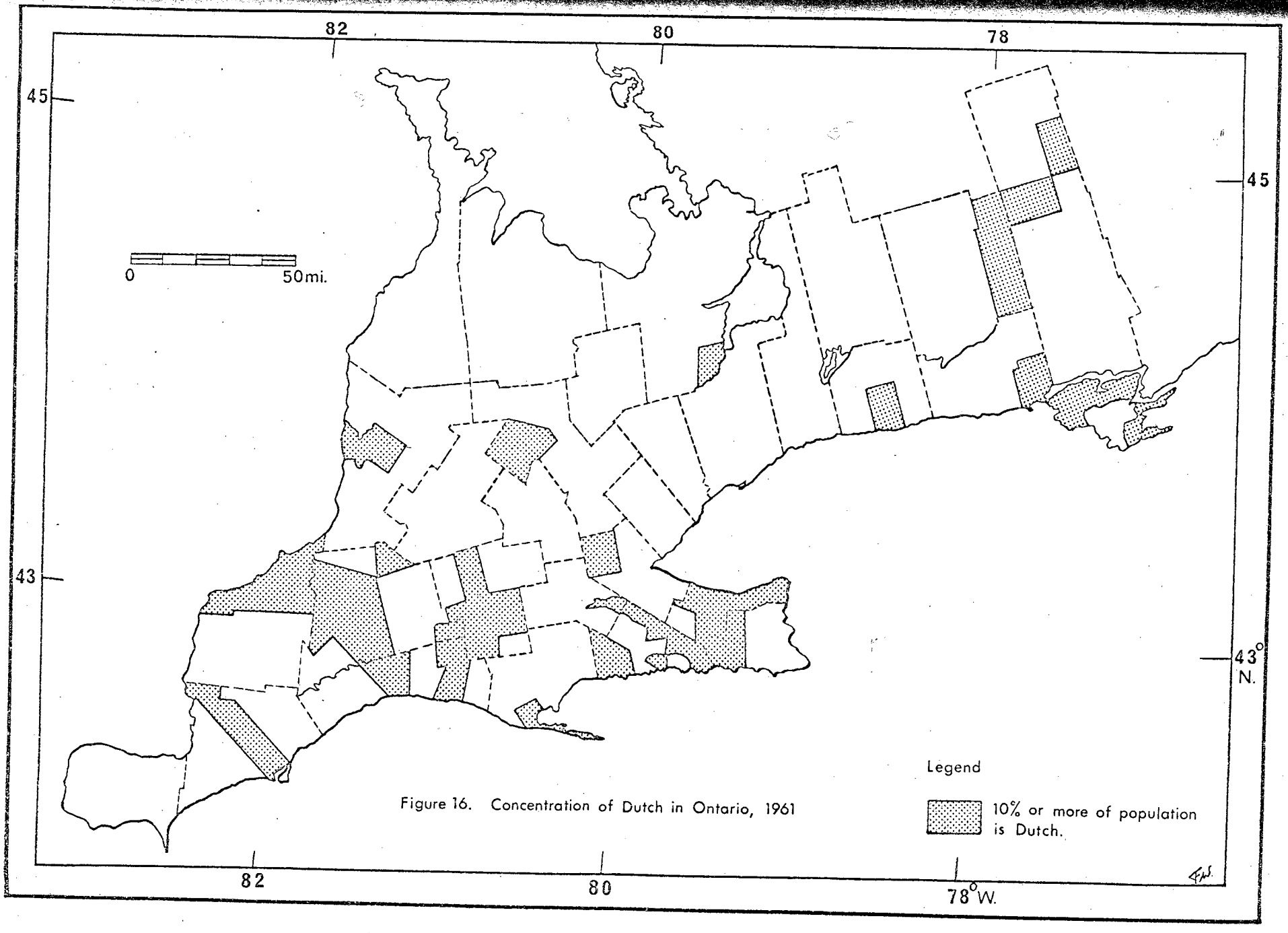

Figure 16. Concentration of Dutch in Ontario, 1961

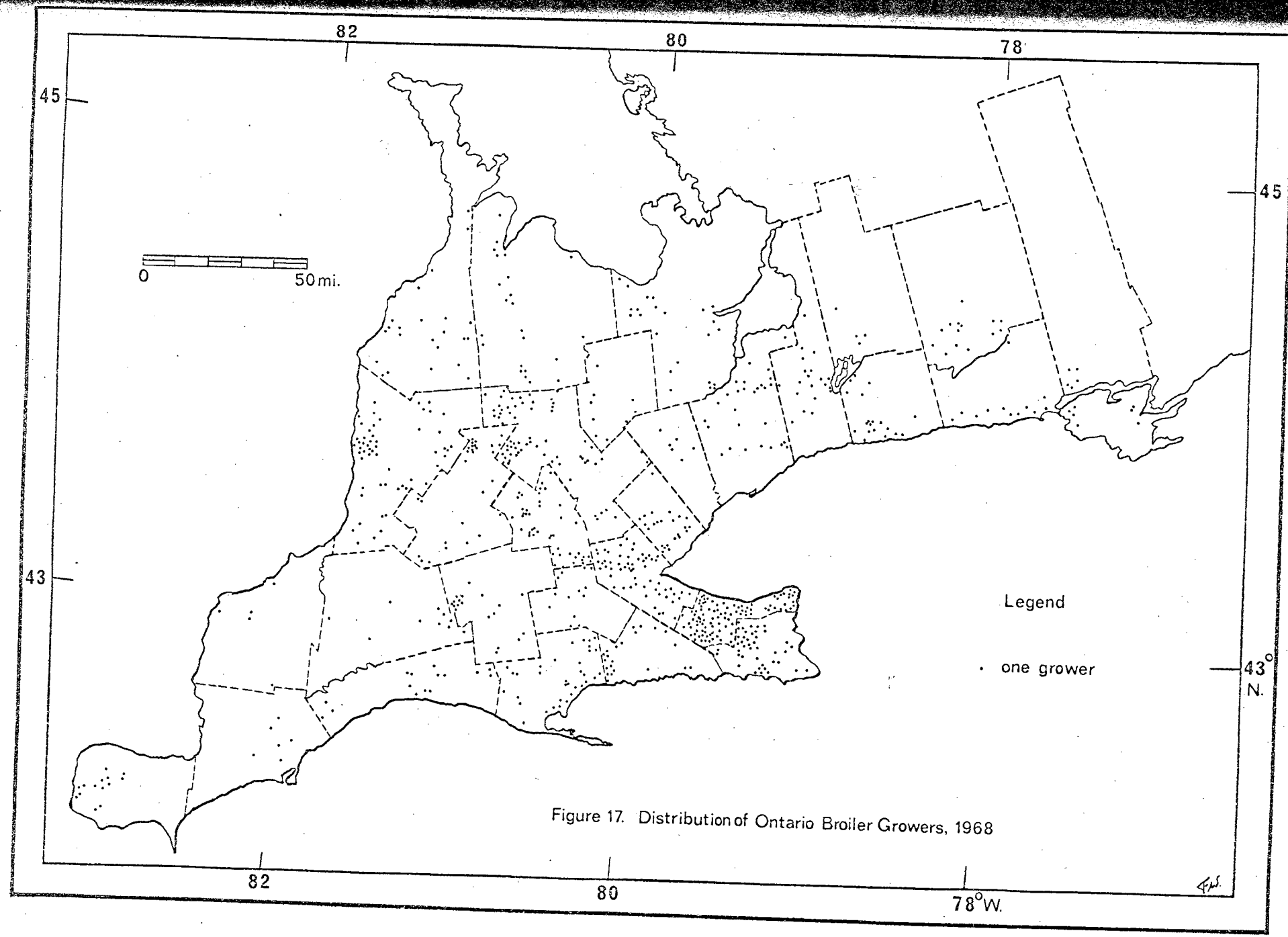

Figure 17. Distribution of Ontario Broiler Growers, 1968

the producers. The 1961 Census of Canada is the latest census with data on the ethnic groups. At that time, 8.1 per cent of the population of Ontario was classified as rural farm dwellers.[19] Of the Dutch population, 19.5 per cent were rural farm dwellers;[20] however, this 19.5 per cent accounted for only 7.4 per cent of Ontario's rural farm population. In other words, while 7.4 per cent of the rural farm population is of Dutch descent (1961), 27.4 per cent of the broiler producers are recent Dutch immigrants (1968). (See Table 8).

The Greeks, in Lincoln County, form another ethnic group, while quite a few Germans are found in Waterloo County. Hungarian and Jewish broiler growers have established themselves in the Niagara Peninsula.

A few more observations on the Dutch growers are warranted because of their very high representation among all the growers. The distribution pattern of all broiler growers is not random at all, but rather clustered with large open spaces (Fig. 17). The center of gravity is in South Wellington, on the Wellington-Halton boundary. Figure 16 shows the townships in which, in the year 1961, at lease 10 per cent of the population was Dutch. All the townships are rural townships, except for St. Catherines. In comparing these maps, it can be seen that clusters of broiler growers occur, with few exceptions, in areas where the Dutch make up 10 per cent or more of the general population. This is not mere coincidence.

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[19] Census of Canada, 1961, V (5-2), Table 13.

[20] Ibid., Bull. I (3-9), Table 115.

TABLE 8

NUMBER AND PERCENTAGE PRODUCERS OF DUTCH DESCENT

County	Broiler Producers		
	Total	Dutch	% Dutch
Brant	15	7	46.6
Elgin	15	3	20.0
Essex	14	-	-
Haldimand	22	8	36.4
Kent	6	-	-
Lambton	5	3	60.0
Lincoln	94	23	24.5
Middlesex	10	2	20.0
Norfolk	36	10	27.8
Oxford	16	2	12.5
Welland	42	20	47.6
Wentworth	61	15	24.6
Bruce	19	3	15.8
Dufferin	9	-	-
Grey	23	3	13.0
Halton	24	5	20.8
Huron	55	34	61.8
Peel	6	1	16.7
Perth	25	4	16.0
Simcoe	23	4	17.4
Waterloo	43	1	2.3
Wellington	69	28	40.6
Durham	18	10	55.5
Hastings	5	2	40.0
Northumberland	12	5	41.7
Ontario	20	4	20.0
Peterborough	14	1	7.1
Prince Edward	7	3	42.9
Victoria	4	-	-
York	28	2	7.1
Province	742	203	27.4

Within the Dutch population of Ontario, three religious denominations are represented most strongly.[21]

Roman Catholic	23%
United	26%
Christian Reformed	22%

At the rural farm level, the Christian Reformed church claims 31 per cent of the people of Dutch descent.[22] Among the Dutch broiler growers, however, at least 52 per cent are Christian Reformed.[23] Why is this so?

First of all, broiler growing, when not mechanized and automated, requires much hard labour. Immigrants coming to Ontario are willing to work hard for a few years in order to establish themselves. Christian Reformed people are Calvinists, and in general, would rather work hard for a guaranteed income (broiler farming is contract farming), than take financial risks to become rich quickly. These people usually work hard because they hold to the belief that everything is given to them in trust by God and as such, they must work responsibly and take good care of their possessions.[24]

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[21]Adrian L. Groenenberg, "The Social Geography of the Netherlands in South Western Ontario with Special Reference to the Role of the Churches in the Integration of the Immigrants" (M.A. thesis, Dept. of Geography, University of Western Ontario, London, 1966), Table IX.

[22]Ibid.

[23]The percentage quoted covers 85 per cent of all Dutch growers.

[24]Orion T.A. Clark, "The Relevancy of Certain Social and Psychological Variables as Related to the Adoption of Recommended Farming Practices among Dutch Dairy Farmers (unpublished M.A. thesis, University of Guelph, Guelph, Ontario, 1966) 26, 63.

Secondly, it has been said by Petersen[25] that the Christian Reformed community, in many areas, is a closed community. This observation substantiates the findings of the author. In many areas where Dutch of different faiths have settled, almost all the broiler growers belong to the Christian Reformed Church. Clinton, Drayton, and Simcoe areas are three examples.

Thirdly, active promotion by feed companies has played a role in the high percentage of Christian Reformed broiler growers. Once a small group of broiler growers belonging to a certain group or community have shown to be good broiler growers, a feed company will sooner provide credit to an additional member of that community than provide credit to a person belonging to an unknown community.

Recent Changes in Grower Location

From May 1965 to February 1968 the location of broiler production was virtually frozen by the Ontario Broiler Chicken Producers' Marketing Board. Since February 1, 1968, broiler growers have been allowed to sell, with some restrictions, their rights to grow broilers to member-growers.

From February 1, to November 30, 1968, 5.88 per cent of the broiler production quotas has changed location. For each county, the change is

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[25]William Petersen, Planned Migration, The Social Determinants of the Dutch-Canadian Movement (Berkely & Los Angeles: University of California Press, 1955), 193.

recorded in three categories: quotas moving out of the county, quotas moving into the county, and quotas moving from one producer to another within the county (Table 9). The size of production space is measured in square feet, where one square foot is necessary to grow one broiler to a weight of four pounds.

Thus far, four factors have helped explain the spatial pattern of broiler production: population, capital investment in agriculture, promotion by related industry, and presence of ethnic groups. It remains to be shown that the quota transfers have to correspond with the hypotheses and the generalizations stated previously.

The spatial pattern of broiler production was frozen for approximately three years, when such factors as population and capital investment in agriculture could change freely. It may be assumed that the changes in the broiler production pattern during 1968, are, at least in part, an adjustment to the other changes. Because of the limited size of the changes in broiler production, and the limited time period covered, the changes cannot be interpretated as conclusive proof, but rather as reliable indicators of present trends. The changes can only be correlated with changes in population. Although it may be assumed that the capital investment in agriculture rises, there are no indications available which show that at present the capital investment per acre rises faster in one county than in another. Also, promotional activities cannot be measured now, since only member-growers are allowed to buy additional production quota. The influence of ethnic groups cannot be measured either, as it cannot be ascertained which producers bought and sold production quotas. The only measure left is the change

TABLE 9

BROILER PRODUCTION QUOTA TRANSFERS IN ONTARIO, FEBRUARY 1 TO NOVEMBER 30, 1968.

County	Out of County	Into County	Within County	No. of Transfers	Producers Lost	Producers Left*
	square feet					
Brant	16,020	5,848	--	2	1	15
Elgin	7,321	40,985	--	5	1	15
Essex	17,224	--	21,005	14	13	14
Haldim.	--	31,082	12,484	5	2	22
Kent	6,000	--	--	1	1	6
Lambton	--	12,163	--	1	0	5
Lincoln	19,038	17,940	26,261	15	10	94
Middles.	6,000	10,000	--	2	1	10
Norfolk	48,676	7,000	278,800	13	6	36
Oxford	4,000	23,540	16,986	6	1	16
Welland	18,390	33,294	5,000	10	4	42
Wentwt.	--	24,900	6,932	5	1	61
Bruce	15,541	--	--	2	2	19
Dufferin	19,020	7,460	--	3	1	9
Grey	13,962	11,000	--	5	2	23
Halton	78,017	18,542	3,120	11	4	24
Huron	--	44,673	5,462	8	1	55
Peel	--	--	--	0	0	6
Perth	11,850	12,824	--	7	2	25
Simcoe	33,051	3,654	--	5	5	23
Waterloo	82,705	15,867	--	12	8	43
Welling.	13,083	127,087	3,972	20	2	69
Durham	--	18,404	4,322	5	1	18
Hastings	--	--	--	0	0	5
Muskoka	20,110	--	--	2	2	0
Northum.	--	20,857	--	2	0	12
Ontario	13,460	--	--	2	2	20
Peterb.	11,232	--	10,840	3	2	14
P. Edw.	13,560	--	--	2	1	7
Victoria	2,070	--	--	1	0	4
York	21,480	4,600	10,150	6	3	28
Glengar.	--	--	--	0	0	1
Grenvil.	--	--	--	0	0	1
Total	491,720	491,720	405,334	211	79	742

Source: Ontario Broiler Chicken Producers' Marketing Board
* author's totals.

in population. The Dominion Bureau of Statistics has just started to publish annual estimates of Canada's population for counties and census subdivisions. At the time of this writing, only data for 1967 are available.[26] These data have been used to calculate the change in population between 1966 and 1967. The changes have been taken to be indicative of the growth rates for the counties. The growth rates were found to be higher than 3 per cent in the counties containing medium sized urban centres: Peel, Halton, Ontario, Middlesex, Waterloo, and Essex, and in counties contiguous to these: Lambton, Wellington, Lincoln and Simcoe. It is clear that the highest population growth rates are still found in the 'suburban' counties. The hypothesis is:

> An increase in population is preceeded by an increase in poultry, followed by a decrease in poultry in any area which becomes urbanized.

In terms of the 1968 quota transfers this means that broiler growing in outlying counties will decrease, in 'suburban' counties it will increase, and in the counties which are rapidly becoming urbanized, broiler growing will decrease. Counties which showed less than 2.5 per cent change in their production capacities or had less than two transfers of production quota will be considered to be stable in their broiler production. These counties are: York, Peel, Wentworth, Lincoln, Welland, Kent, Lambton, Perth, Grey, Victoria, and Hastings.

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[26]Dominion Bureau of Statistics, Population Estimates for Counties and Census Subdivisions, Cat. No. 91-206, Annual 1967, Table 6.

Consulting both Table 9 and Figure 18, the following changes in the broiler production pattern are noticeable. Counties showing only an outflow of production quota with no quota entering are in the outlying areas, Ontario county excepted: Essex, Bruce, District of Muskoka, Prince Edward, Peterborough, and Ontario. Counties showing only additions to their production capacities are the 'suburban' counties: Huron, Haldimand, Durham, and Northumberland. The last county is an exception. Counties which show an increase of over 2.5 per cent in their production capacity are: Elgin, Middlesex, Oxford, Haldimand, Huron, Wellington, Durham, and Northumberland. These are all 'suburban' counties, except Northumberland. Decreases in 'suburban' counties are shown by Halton, Waterloo, Ontario, Dufferin, Simcoe, Brant, and Essex. Of these, Halton, Ontario, and Waterloo are being urbanized rapidly; the decrease in Essex County will be explained in Chapter IV; Simcoe and Dufferin in effect are both 'suburban' and outlying counties; Brant County is and always has been an anomaly as broiler density was always much lower than would be expected.

The over-all picture of production transfers lends support to the population hypothesis. Most recent increases in broiler production have taken place in 'suburban' counties which are contiguous to counties containing a medium sized urban centre; Elgin, Huron, Wellington, Haldimand, and Durham. Of the two remaining counties showing an increase, one has a medium sized city (Middlesex County), and the other is next to a 'suburban' county (Northumberland County). At the same time, Halton, Ontario, and Waterloo counties, together with other counties which are

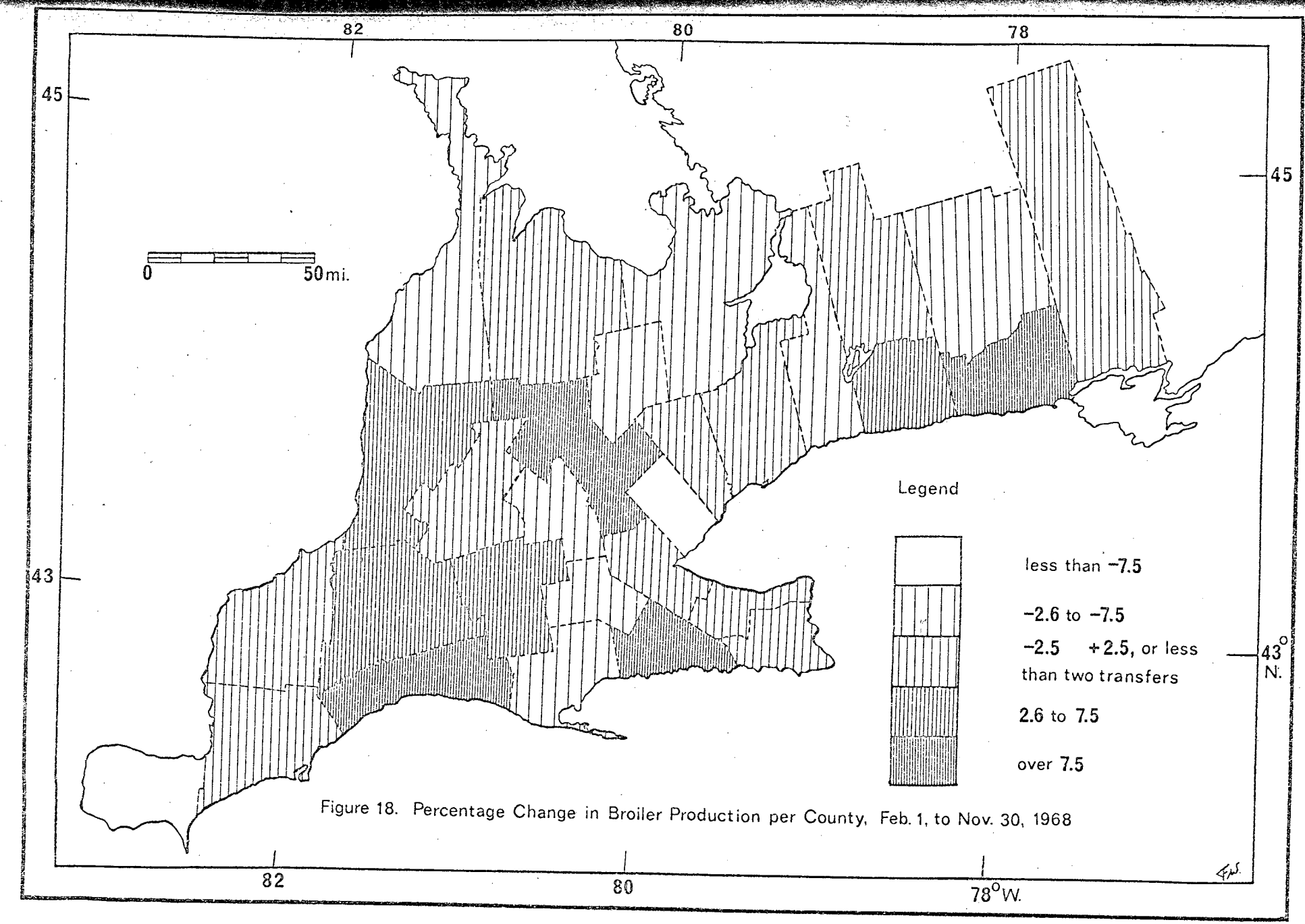

Figure 18. Percentage Change in Broiler Production per County, Feb. 1, to Nov. 30, 1968

becoming urbanized quickly (Peel, York, Lincoln, and Wentworth) show a decrease or no significant change in their broiler production capacity. At present, broiler production is moving from the outlying areas of Southwestern Ontarion into 'suburban' counties which do not contain a medium sized city of one hundred thousand to five hundred thousand people, and is constant or declining in the remaining counties.

Conclusions Regarding Grower Locations

The spatial patterns of broiler growers in Ontario can be summarized in the following manner:

1. Population density and capital investment in agriculture have been shown to be the strongest factors in determining the general spatial pattern of broiler production. An increase in the population density will lead to an increase in broiler production nearby, but often the area showing an increase in broiler density extends into the next county. When the population pressure continues to rise, broiler production is forced into less urban townships and counties.

2. Capital investment in agriculture is influenced in part by population density, in part by soil and climatic factors. A rise in the capital investment in agriculture per acre land will lead to a higher broiler density.

3. Promotion through credit arrangements has contributed to deviations in the general pattern. Promotion has restricted broiler growing to Southwestern Ontario.

4. The spatial pattern of broiler growing has been influenced also by the availability of growers. Many broiler growers are post World War II immigrants, and over one quarter of them are of Dutch descent.

5. The spatial pattern is clustered for two reasons: firstly because effective promotion has taken place in certain areas only; secondly because the acceptance of this new farming practice has been influenced greatly by social contacts among growers and potential growers of broilers.

Processor Location

Since World War II, the poultry production has become much more concentrated, both in number of growers and in bird density, around the medium sized cities of Ontario. Processor location has undergone even more drastic changes. For example, most broiler processing facilities, now operating, have been built since 1950. Processing plants have greatly expanded in size. In addition, many have shifted from the small rural towns to the urban fringes of the medium sized cities.

Historical Shifts in Processing Plants

In the spring of 1945, the Poultry Industry Committee of Ontario prepared a map showing the location of eighty-two poultry processing plants in Ontario. The map was reproduced in the Canadian Poultry Review,[27]

[27] "Ontario Poultry Processing Plant Locations and Facilities," Canadian Poultry Review, LXIX, 4 (April, 1945), 38-39.

together with a summation of the six-month kill capacity per county. Only some of these plants are still operating today. Most have become specialized and handle only one or two types of poultry on a regular basis. Plant automation has led to an increase in size of the plants. While in 1945 a plant killing ten thousand birds per week was considered to be large, today the nineteen largest broiler processing plants average about fifty thousand birds per week. About five plants can handle over one hundred thousand broilers per week. Yet Ontario plants are small in comparison with some south of the border. Holly Farms Poultry Industries Inc. U.S.A. has three processing plants, which handle twice as many broilers per week as Ontario produces in the same time period.[28]

Ontario has nineteen broiler processing plants which average ten thousand or more broilers per week (Fig. 19). There are about eighteen more smaller plants scattered throughout Southwestern Ontario, accounting for about 2 per cent of the weekly kill.

In 1945, the processing plants were clearly producer oriented, being located throughout the rural counties, with only a few plants in the cities. During the 1950's a new processing technique was introduced, assembly line methods were adopted, together with stricter health regulations. These changes necessitated larger plants. Larger plants were also required by the new retail chain stores, which wanted large, uniform quantities of broilers at specified times. Larger plants needed

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[28]"Holly Revisited," Broiler Industry, XXXI, 4 (April, 1968), 28-29.

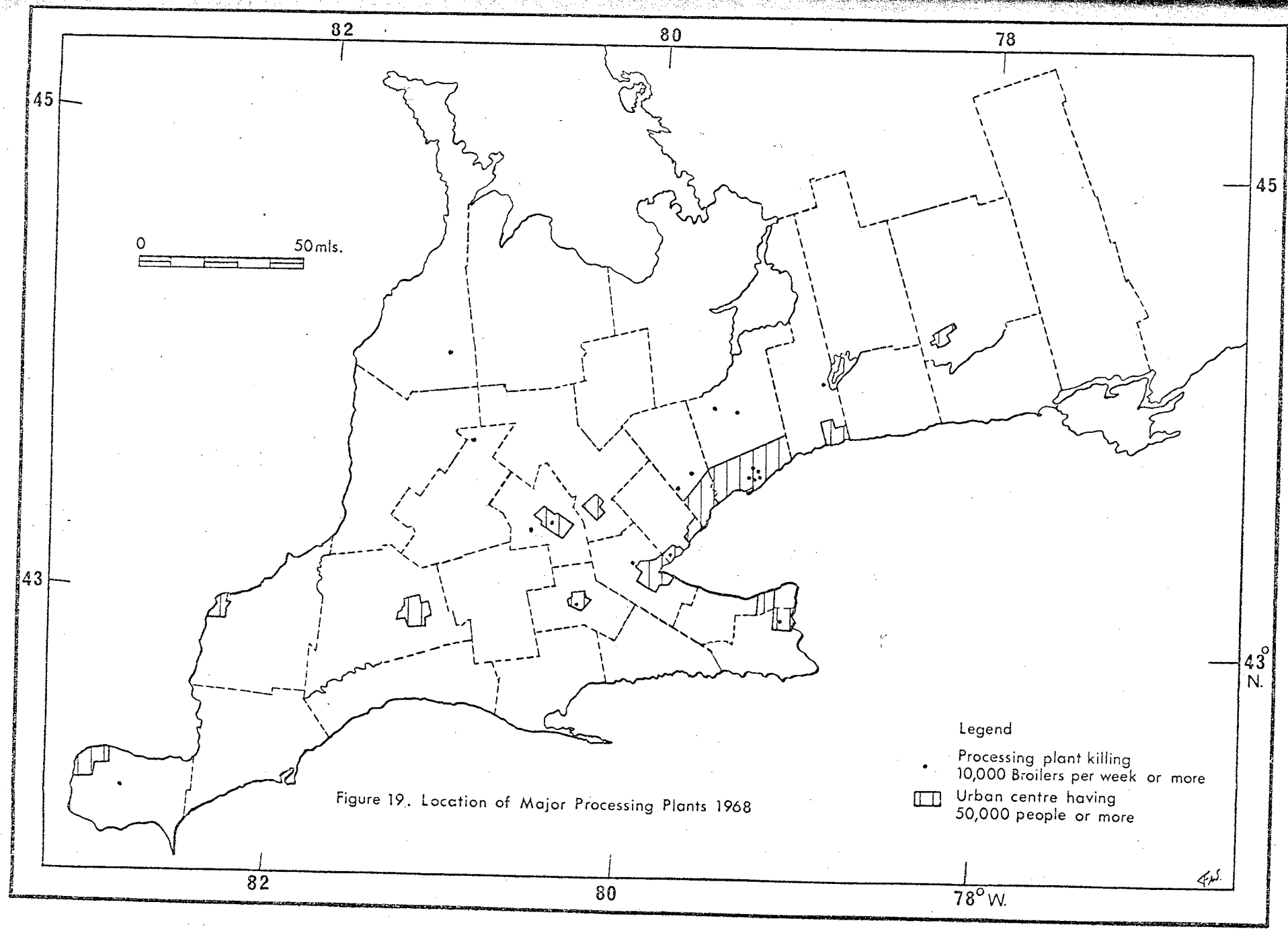

Figure 19. Location of Major Processing Plants 1968

a larger labour pool. Hence locations in or close to larger urban centres were needed. Lastly, a balance had to be found between distance from producer and consumer.

Thus the following factors have caused the great changes in number and location of processing plants between 1945 and 1966: specialization, change in processing technique, health regulations, bankruptcy and vertical integration, chain stores, and labour needs.

Present Pattern of Processing Plants

A list showing the processing capacity in each county cannot be given without revealing individual capacity which is confidential information. Some additional remarks can be made, however, regarding the nineteen plants shown in Figure 19. The nineteen plants process 98 per cent of Ontario's broilers, while the five plants in Toronto process about 10 per cent of this total. Thus the fourteen plants outside of Toronto handle 88-90 per cent of the weekly kill.

All plants, except two, are within easy reach of or in urban centres of fifty thousand people and over. This does not necessarily mean that they are close to market, as will be seen later. Of the two exceptions, one plant makes chicken soup and related products, and is next to its own broiler growing facilities; the other plant is located in an economically depressed region (Bruce Co.) and receives tax benefits. These two processing plants are definitely producer oriented. The question remains whether the remaining plants are producer or consumer oriented. To this end, it is necessary to look more closely at the supply regions of the processing plants and their sales territories.

Location of Supply Regions of Processing Plants

Several processors have given the author permission to have access to records giving the size and locations of their growers. These records are kept by the Ontario Broiler Board in Burlington. The records of four processing plants were analyzed to find the average distance between the grower and the processing plant and the density of the plant's supply field.

A is the direct distance.

$$A = \frac{\Sigma(\text{birds} \times \text{air distance})}{\text{birds}}$$

Direct distance can be converted to road distance (M) by the formula:

$$M = 1.214A + .471$$

This equation is a regression estimate based upon twenty-five samples of common road and air distances, taken at random around five processing plants in the province (Fig. 20).

The average distance travelled by the four selected processing plants were, in ascending order, 33, 41, 57, and 73 road miles per live broiler. These values are based on the year September 1967 to August 1968. In the Eastern United States, in 1959 Henry et. al.[29] found that the average live haul in road miles per region varied from 23.5 to 47.2. The average of the four Ontario values is 51 miles, and although this figure is not necessarily the actual average for all plants, the author

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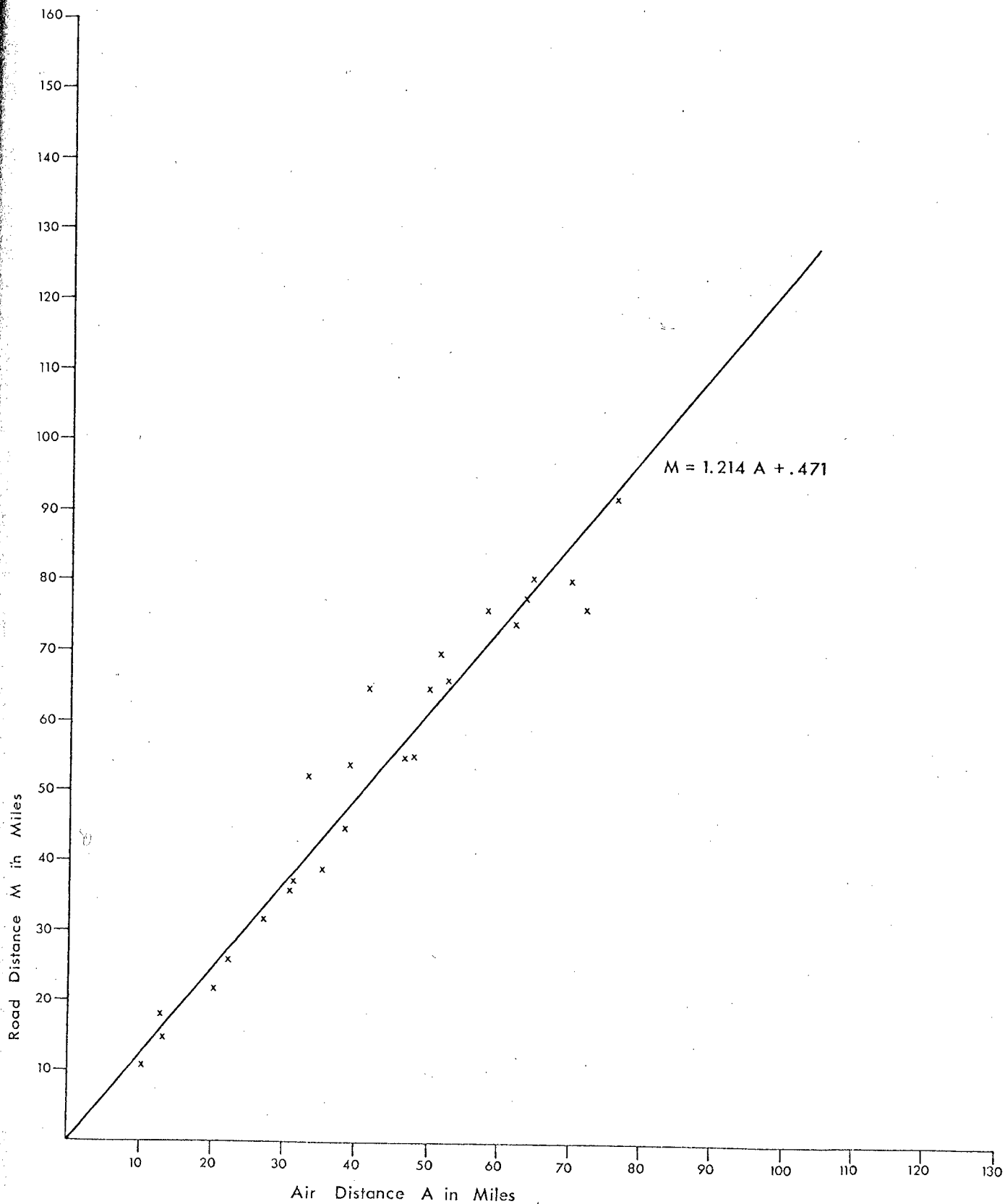
[29]Wm. Henry, J.S. Chappell, and J.A. Seagraves, Broiler Production Density, Plant Size, Alternative Operating Plans, and Total Unit Costs, Tech. Bull. No. 144, (Raleigh, N.C.: North Carolina Agricultural Experiment Station, June, 1960), Table 10.

Fig. 20. Correlation between Road Distance and Direct Distance



has reason to believe that 51 miles is a good approximation of the average value.

Average live haul distance is smaller for larger processing plants, and smaller yet if the processing plant is an independent. Processing plants owned by feed companies have to travel varying distances, depending on where the feed is sold. For this reason, the highest live haul values are for processing plants owned by feed companies. These generalizations are based in part on above calculations and in part on the results of the first processor's questionnaire (Appendix B).

The average live haul can be used to calculate the density of the broiler supply field around a processing plant if:

1. the broiler growers are evenly distributed around a processing plant in all directions;

2. the broiler growers are all the same size.

These two conditions are never realized, but in some cases closely enough approximated to justify the calculation of the effective density of the broiler supply field. Henry et. al. have calculated this measure by means of the following formula:[30]

$$D' = \frac{4V}{9\pi A^2}$$

D' = effective density of the broiler supply field, expressed in broilers per square mile per year.

V = annual volume of birds processed.

A = average live haul in air miles.

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[30] Ibid., 16-22.

Henry's data were supplied by processors in Eastern United States, and the D' values varied from 151 to 8,360, averaging about 2800 birds per square mile per year.[31]

Because of the geography of Ontario and the distribution of the producers, the calculation of D' values was only valuable for three Ontario processing plants. Their values were 134, 525, and 1023 broilers per square mile per year.[32] High values are caused by high annual volumes and low live haul distances. Comparison between Eastern United States and Ontario values leads one to conclude that the Ontario processing plants are much smaller than the Eastern United States plants.

Distribution of Processed Broilers

The findings discussed in this section are taken from the processor's questionnaires. This section will only deal with the distance travelled to sell the produce. The types of outlets to which the produce is sold is dealt with in Chapter III.

Almost all broilers which are processed in Ontario are sold in Ontario. A few of the largest companies sell some truckloads to the Maritimes, but not on a regular basis. The following generalizations are valid for the Ontario market:

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[31] Ibid., Table 10.

[32] The formula had to be changed slightly to $D' = \frac{V}{2\pi A^2}$. Henry et.al. assumed that $A = \frac{2}{3}R$ (p.18), where R is the radius of the broiler supply region. When the field is homogeneous as assumed, however, $A = R\sqrt{\frac{1}{2}}$. The result is that the Ontario D' values are nine-eighth times the U.S. values. Ontario D' values comparable to U.S. values are 119, 467, and 909.

1. the larger the processor, the larger his sales territory;

2. almost all processors sell to Toronto outlets;

3. Eastern and Northern Ontario are served on a regular basis by the five largest processors only;

4. processors located in Toronto only sell in Toronto;

5. three regions have insufficient processing (as well as production) facilities to supply their population with broilers: - Eastern Ontario, Northern Ontario, and the region southwest and west of London, Middlesex;

6. processing plants handling less than 35,000 broilers per week travel further to buy than to sell;

7. processing plants handling more than 35,000 broilers per week travel further to sell than to buy.

The question remains whether the processing plants are producer or consumer oriented. The answer is not easily given, and any one answer will not be valid for all plants. The producers occupy a smaller area than the consumers of Ontario broilers, a fact which complicates matters even more. However, the following generalizations can be made.

1. Processors located in Toronto are definitely consumer oriented. Many of their broilers are grown in Lincoln and Wentworth counties, but they are all sold in Toronto.

2. Processors in isolated areas, for example in Essex and Welland counties, have both their supplies and their sales outlets within easy reach of the plants. This situation occurs only when the area is under-supplied by the processor.

3. The third group of processors have a fairly small procurement territory surrounding their plants, while sales cover an area up to twenty times as large. This group is generally located near the centre of its procurement territory, while its sales territory may extend over most of the province.

4. The last group of processing plants is located close to the largest urban centres. These cities buy most of their processed broilers. Live birds come from almost all parts of Southwestern Ontario, because of feed-chick-processing contracts. This last group contains large processing plants operated by national and international feed companies.

The first and the last group can be said to be consumer oriented; the third group is more producer oriented, while the second group is both consumer and producer oriented.

III DISTRIBUTION ANALYSIS OF PROCESSED PRODUCT

This chapter will outline the paths taken by the broilers from the processing plant to the consumer. The information has been collected by questionnaire at the processor level. Questionnaires were sent to all processors and nineteen processing plants returned the questionnaires with the requested information. These nineteen plants are not necessarily the same ones as those shown on Figure 19. One processor answered that he was no longer in business, while another wrote that the information asked for was confidential and could not be supplied. The returns accounted for about 70 per cent of the Ontario broiler processing capacity. (See Appendices B and C for questionnaires).

General Flow Pattern

The general flow pattern taken by the broilers from processor to consumer is given in Figure 21. A description of the terms used for the sales outlets is necessary since there appears to be some difficulty in the interpretations of such terms as wholesales, chain store, and independent store.

Wholesalers generally sell to retail outlets, although a few do sell to consumers, especially to members of food clubs. Difficulty in classification arises when a wholesaler owns a chain of retail stores and buys all the merchandise for these stores. One processor told the author the following.

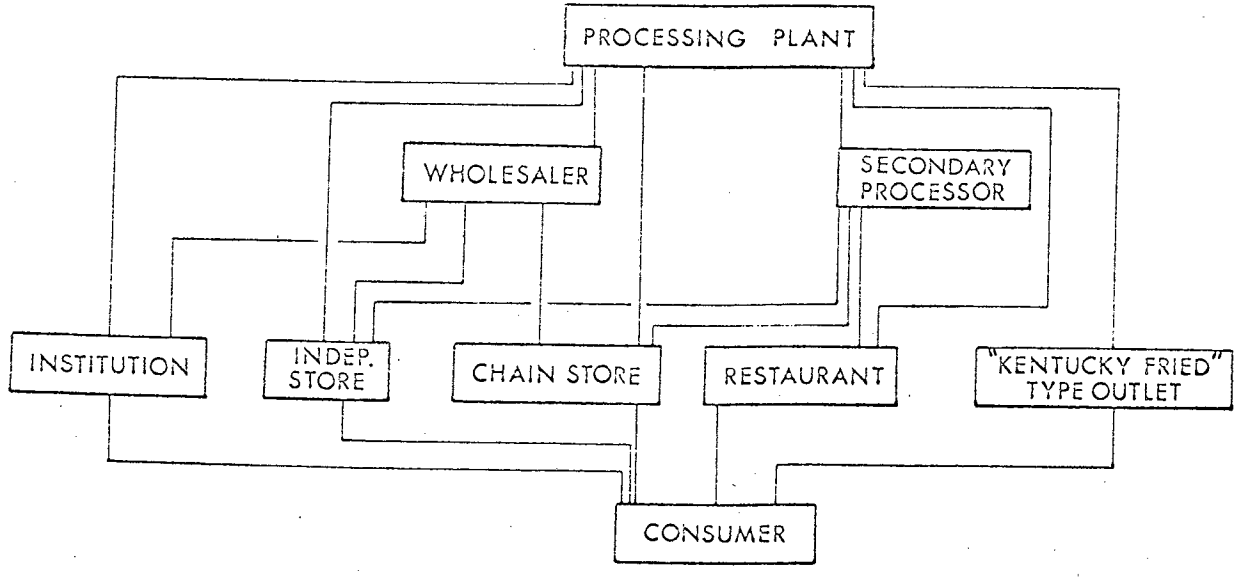

Figure 21. Produce Flow Chart from Processor to Consumer.

> If a wholesaler, owning a chain of stores, orders broilers, this sale will be classified in one of the following two ways. If the broilers are delivered to the wholesaler, the transaction will be classified as 'wholesale'. If the broilers are delivered to the wholesaler's stores, the transaction is labelled as a 'chain store sale'.
>
> In case of sales to other chain stores, two possibilities are open. Orders coming from head office of the retail chain are classified as 'chain store sales', while orders coming from individual chain store outlets are labelled as 'sales to independent stores'.

Upon checking with other processors, the author found that the above methods of sales classifications were followed in case of the wholesaler, but not in the case of sales to the chain stores. As a result, the author can give the following definitions as they relate to retail stores mentioned in this study. In this thesis, a chain store is defined as a retail outlet belonging to a group of four or more stores operated under the same name. All the remaining stores are independent stores.

Institutional outlets cover schools, hospitals, nursing homes, and military establishments. The eating places have been divided into two groups, restaurants and 'Kentucky Fried' type outlets. Both are important outlets for chicken, the restaurants traditionally so, while 'Kentucky Fried' type outlets become more popular every year.

The secondary processor plays a very minor role in Ontario. Processing past the killing and cleaning stage is either done by the processor himself, or by the retail outlet. The "jobber" is grouped with the wholesaler. His function is similar to that of the wholesaler except that he operates on a much smaller scale.

Relation Between Type of Processor and Type of Outlet

A strong relation exists between the size of the processing plant and the type of outlet it will serve. The large numbers of broilers needed for a feature sale of broilers in a supermarket chain, can only be supplied by large processors. On the other hand, if a restaurant discovers on Saturday afternoon that it needs five more baskets of chicken before Monday, only a small processor or "jobber" is willing to supply them. For this reason, the processing plants are grouped according to size, and the outlets used are analyzed for each size group.

The second distinction within the group of processing plants is the method of processing. In 1968, twenty-nine processing plants in Ontario received licences to process broilers.[1] Sixteen plants used the evisceration method and thirteen the New York dressed or Kosher method. The essential difference between the two methods is the scalding temperature. Eviscerated poultry has been exposed to a much higher scalding temperature than the New York dressed poultry. Other differences concern the degree to which the broiler is cleaned and trimmed. The eviscerated bird is reduced to 75 per cent of its live weight, while the average weight of the New York dressed bird is taken to be 87 per cent of its live weight.[2] In Ontario, the New York dressed plants handle generally less than 20,000 birds per week, while plants handling over 20,000 broilers weekly are almost all evisceration plants. The evis-

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[1] E.D. Malloy, Ontario Broiler Board, Burlington, personal communication, Nov. 12, 1968.

[2] Mode, personal communication.

ceration process has gained in prominence since it was introduced in the 1950's. The results of the questionnaires indicate that 83.2 per cent of the Ontario broilers are eviscerated (Table 10).

Plant Processing Less Than 10,000 Broilers Per Week

Five processors who returned the questionnaires handled less than 10,000 birds per week. These processing plants have several things in common. They are located either in Toronto or in the rural villege. The independent store is the most important outlet, with the wholesaler a distant second. Some broilers are sold to restaurants, while a very small number find their way to institutions and secondary processors. Chain stores and 'Kentucky Fried' type outlets are out of reach of these small processors.

Plants Processing 10,000 to 30,000 Broilers Per Week

Seven processors who returned the questionnaire fell into the 10,000 to 30,000 broilers per week category. The majority of these processing plants are located in Toronto and most of them use the New York dressed method. The independent store is still the most important type of outlet. The chain store, used by two processors only, accounts for 21.7 per cent of the total sales. Sales to restaurants and institutions, in this category, are twice as high as the average value for all processing plants. The wholesale outlet is used to some extent, as well as the 'Kentucky Fried' type outlet.

TABLE 10

PERCENTAGE BROILER SALES TO OUTLETS USED BY PROCESSING PLANTS, BY SIZE CATEGORY AND PROCESSING METHOD.

	'000 broilers processed per week				New York dressed	Eviscerated	Average
	less than 10	10 to 30	30 to 60	over 60			
# Processors	5	7	3	4	10*	11*	19
Outlets: Indep. store	86.6	42.0	14.4	22.4	58.8	20.0	26.6
Chain store	--	21.7	59.4	46.1	4.3	50.3	42.5
Wholesaler	11.1	6.9	12.2	11.8	8.1	11.5	10.9
Second. Proc.	--	--	.5	.5	--	.5	.4
Institution	--	8.6	1.4	2.4	9.2	2.1	3.3
"Kent. Fried" type outlet	--	6.1	5.8	11.1	3.6	10.0	8.9
Restaurant	2.1	14.6	6.3	5.8	15.9	5.6	7.4
Percentage of total returns	3.2	18.0	17.1	61.7	16.8	83.2	100.0

* Two plants use both processing methods.

100.0% = 754,300 broilers per week.

Plants Processing 30,000 to 60,000 Broilers per Week

Only three processors handling between 30,000 and 60,000 broilers weekly returned the questionnaire. The return for this category was the lowest. No generalizations can be made about the locations of these plants.

All types of outlets are used, with chain stores handling about sixty per cent of the broilers. With the increasing size of the processing plant, the importance of the independent store as a broiler outlet has dropped from 86.6 per cent to a low of 14.4 per cent. The chain store has at the same time risen in importance from zero to 59.4 per cent (Table 10). Sales to institutions and 'Kentucky Fried' type outlets are lower than average.

Plants Processing More Than 60,000 Broilers per Week

The last size category includes plants handling more than 60,000 broilers per week. The upper limit is well below 150,000 broilers weekly. Plant location varies, although most are close to or in large and medium sized urban centres.

The chain store once again is the major outlet, but less important than in the last size category, namely 46.1 per cent instead of 59.4 per cent. At the same time, the sales to independent stores have risen from 14.4 per cent to 22.4 per cent. According to the results, most 'Kentucky Fried' type outlets are served by this group of processors. Since most of these outlets insist on buying 2-1/4 lb. eviscerated broilers, it can be seen quite easily that large supplies of this exact weight can be supplied only by large processing plants. Sales to other outlets are

close to average.

New York Dressed Plants

One half of the New York dressed plants are located in Toronto, the other half are found throughout Southwestern Ontario, mostly in rural towns and villages. The returned questionnaires in this group, however, came mostly from Toronto (seven out of ten). Much of this Toronto processing is directed towards the Jewish or Kosher trade, a fact which will be reflected in the results.

All New York dressed plants handle 30,000 broilers weekly or less. The average size of the ten plants who answered is 12,500 broilers. Two plants indicated that they use both New York dressed and the eviscération method.

Well over half or 58.8 per cent of the New York dressed product is sold through independent stores. Major customers are Jewish people and persons coming from the Mediterranean countries. Restaurants and institutions buy proportionately more New York dressed than eviscerated broilers. Two factors will help to explain this. First of all, the percentage restaurant owners of South European origin is higher than average.[3] Secondly, many New York dressed plants process their broilers according to customers' desires, for instance, in the Kosher style.

Only 4.3 per cent is sold through chain stores and 3.6 per cent through 'Kentucky Fried' type outlets. Sales to wholesalers are close

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[3]Census of Canada, 1961, Labour Force Bulletin, 3.1-15, Table 22.

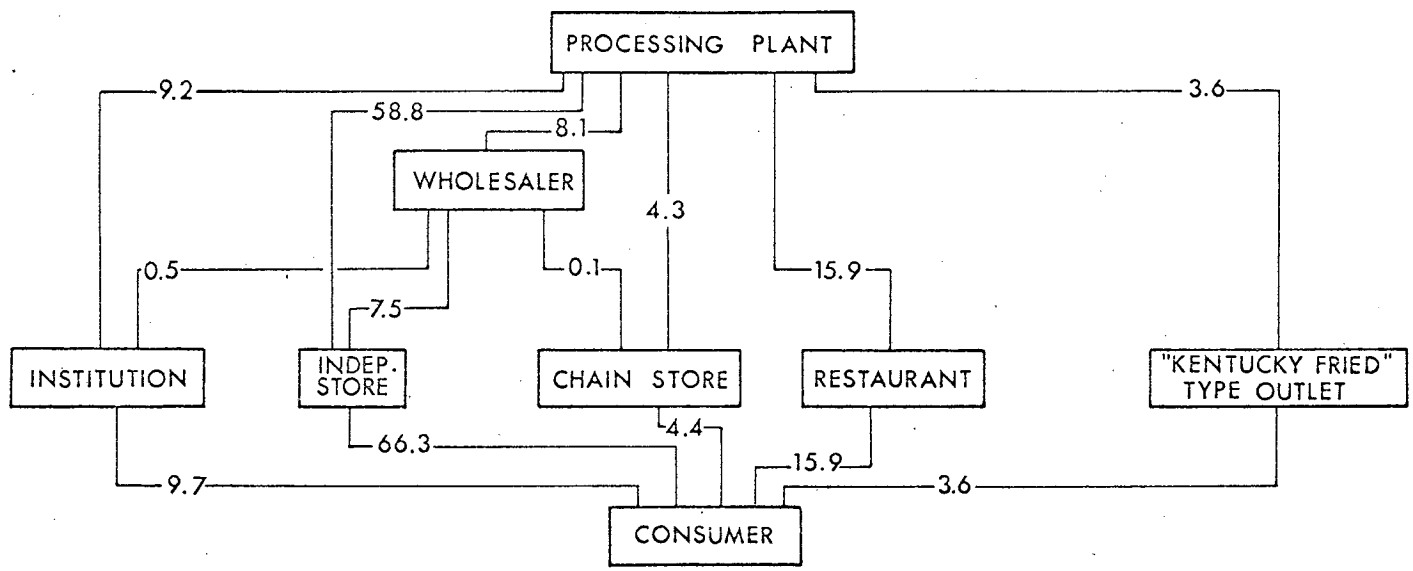

Figure 22. Flow Chart of New York Dressed Produce, Percentage Distribution.

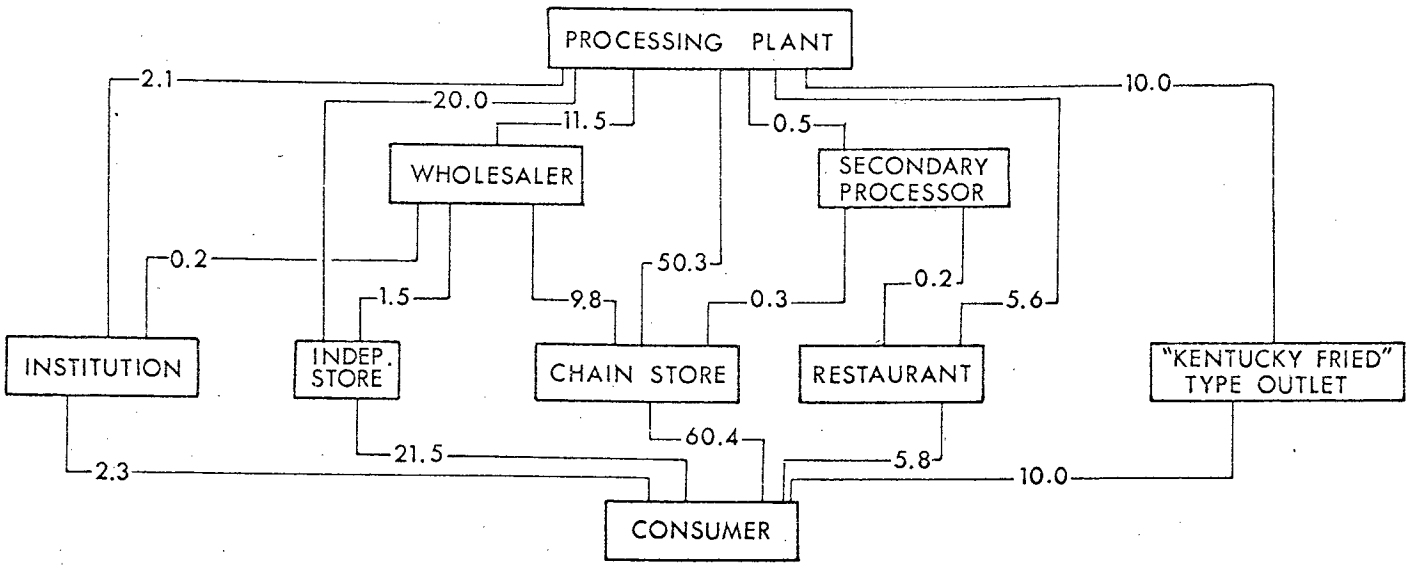

Figure 23. Flow Chart of Eviscerated Produce, Percentage Distribution.

to average, and sales to secondary processors almost non-existent.

Evisceration Plants

The results from eleven plants using the evisceration method are also found in Table 10. According to questionnaire results, this group handles 83.2 per cent of all the broilers. One half or 50.3 per cent is sold to chain stores, and 20.0 per cent to independent stores. Most of the 11.5 per cent sold to wholesalers will find its way to the consumer via chain stores. Ten per cent of the broilers are sold to 'Kentucky Fried' type outlets. Restaurants and institutions account for 5.6 per cent and 2.1 per cent respectively, while half of one per cent goes to secondary processors.

All Processing Plants

At this point, it must be emphasized that not all categories and sectors of the industry are equally well represented in the questionnaire returns. Returns from the New York dressed plants are much higher percentage wise than the returns from the eviscerated plants. For this reason, the averaged results for all processing plants lose some of their value. The most accurate and most useful results are those given separately for the New York dressed and the evisceration plants (Figs. 22, 23).

Results of all returns show that 42.9 per cent of all broilers are sold to chain stores, 26.6 per cent to independent stores, 10.9 per cent to wholesalers, 8.9 per cent to 'Kentucky Fried' type outlets, 7.4 per cent to restaurants, 3.3 per cent to institutions, and 0.4 per cent to secondary processors.

Other Questionnaire Results

The processor questionnaire which was sent out in 1968 asked for detailed information regarding packaging and selling of broilers or parts thereof to different outlets (Appendix C). Unfortunately, these sections were answered only in part by most processors.

The questionnaire results show that more than three fourths of the broilers are sold whole, the percentages ranging from sixty to one hundred per cent of the produce. Sales of legs and breasts are about 15 per cent, while the remaining produce is distributed among the remainder of the cut-up chicken.

Most of the broilers are ice-packed when shipped except when the processed product has to travel only short distances. In the latter case, chilling is used. The results indicate that a processor either uses ice-packed or chilling methods to ship his product. Frozen produce consists mostly of whole broilers, with some cut-up legs and breasts. Frozen produce is usually sold to wholesalers and chain stores. Only one processor reported the handling of pre-cooked broilers.

Broilers are sold to different outlets in various forms and sizes. Some of these forms may include whole chickens, legs, backs, breasts, and livers. The cut-up parts of the chicken are mainly sold to retail stores; necks and backs may be sold to secondary processors.

Whole broilers are sold to all outlet types. Restaurants and "Kentucky Fried" type establishments order this form extensively.

Different sized broilers are wanted by different outlets. Consequently the Ontario Broiler Board has divided the broilers into three size categories depending upon their finished live weights. The three categories are:

Junior broiler	2.9 pounds average,
Special sized broiler	3.0-3.8 pounds average,
Standard broiler	over 3.8 pounds average.

Junior broilers are designated for T.V. dinners, for restaurants, and some for the "Kentucky Fried" trade. Special sized broilers are usually sold to "Kentucky Fried" type of establishments, institutions, and restaurants, while the main market for the standard broiler is the retail store.

Ten of the nineteen processors reported that they only handle standard broilers, while one reported he only handled special sized broilers. The larger processors (30,000 and over) handle two or all three sizes of broilers.

The number of forms in which broiler chickens are sold varies greatly. Some processors sell whole chickens only. The average number of items for sale from processors is around twelve, while the highest number reported is seventy-five.

IV THE ONTARIO BROILER CHICKEN PRODUCERS' MARKETING BOARD

Legal Structure of the Board

After an approving vote by the broiler producers of Ontario, the Ontario Broiler Chicken Producers' Marketing Board became a reality on April 22, 1965.[1] The Ontario Broiler Board consists of nine member-growers elected from nine district committees, which in turn are elected by the member-producers in each of the nine districts.

Basically, the function of the Ontario Broiler Board is to control and regulate the marketing of broiler chickens within Ontario. The board tries to do this by regulating the supply of broilers in three month periods. A quota advisory committee representing a cross-section of the broiler industry recommends the size of production for each three month period and the Broiler Board implements these recommendations after approval by the provincial Farm Products Marketing Board. All broilers growers are registered and their production capacity or production quota is fixed. The Broiler Board controls the production quotas and has the power to revoke them. The Broiler Board sets the live price of the broilers weekly, but has no control over other prices related to broiler growing, processing, or consumption. The Broiler Board has control only over broiler chickens produced in Ontario. It cannot stop

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[1]Ontario, The Ontario Broiler Chicken Producers' Marketing Plan, Ontario Reg. 100/65, (Toronto: Parliament Buildings, 1967).

imports of broilers into the province, but it does regulate broiler production for export and interprovincial trade.

The broiler growers wanted a marketing board for mainly two reasons: to keep production in the hands of the producers, and to prevent price valleys to ensure a reasonable return to producers.[2]

Influence of Board on Location of Broiler Producers

During 1965, production quotas have been given by the Broiler Board to broiler producers and the quotas have been affixed to the broiler buildings. Up to February 1, 1968, the board has stringently controlled production locations, by making movement of quotas virtually impossible. The board has effectively limited the number of producers by refusing entry into broiler production to any one by means other than buying an existing broiler operation. As of February 1, 1968, the outright sale of quotas has been allowed under the following restrictions:

1. The buyer has to be a member-grower as of February 1, 1968.
2. The buyer may increase his basic quota to a maximum of thirty thousand square feet of growing space.
3. The acquired quota may not be sold within two years of purchase.
4. The acquired quota has to be applied to a building or buildings which is or are located on the same parcel of land as the grower's other building(s).

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[2]Bruce McNamara, "Explains Needs of Marketing Board," Can. Poultry Review, LXXXIX, 6 (June 1965), 30-31. Gerald Tedford, "Chairman's Report," Third Annual Report, 1.

5. The seller of a quota has to reduce his broiler production by an amount equal to the size of the sold quota.[3]

The policies of the broiler board have been designed mainly to stop vertical integration, which, in this case, means the buying of production quota by feed mills, hatcheries, and processing plants. Outright sale of production quota has allowed the small producer to either increase his production to a more economic size,[4] or leave the industry. Farm buildings having production quota affixed to them have been bought and sold freely, however, these title transfers only refer to the owner of the building while the production quota remains in the same location without any change in quota size. These title transfers do not affect the location of broiler production. Sale of production quota without sale of farm buildings, however, does affect the location of broiler production, and cannot be dismissed without discussion.

Quota transfer data covering a ten month period from February 1 to November 30, 1968, were supplied by the Ontario Broiler Chicken Producers' Marketing Board (Table 9). The last column gives the number of producers per county. The board and this author used the same definition of producer: "a person engaged in the production of broiler chickens",[5] but they are not able to reach agreement on the total number

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[3]Ontario Broiler Chicken Producers' Marketing Board, "Policy Statement No. 32" (unpublished regulation, Burlington, 1968).

[4]No reason has been given for the 30,000 sq. ft. upper limit; a fully automated operation of 30,000 sq. ft. can easily be handled by one person.

[5]The Ontario Broiler Plan, section 2(d).

of producers.[6]

The policy of the marketing board has allowed adjustments in the broiler production pattern. However, quota can be purchased only by producers until they reach the thirty thousand square feet ceiling. Approximately 19 per cent of the producers have already reached the 30,000 sq. ft. maximum, and as a result are unable to expand their production through quota buying. These producers can only expand their production through the purchase of additional farms and must then operate at these locations.

Quota transfers in the ten month period in 1968 totalled 897,054 sq.ft., or 5.88 per cent of the total production capacity. Seventy-nine producers or 9.6 per cent sold out completely. Since the percentage quota transferred was much less than the percentage producers lost, the producers who left the broiler business had smaller than average quotas. The total number of transfers was two hundred eleven, much higher than the number of producers lost because of the 30,000 sq. ft. upper limit. The average production quota during this period increased from 18,571 sq. ft. to 20,549 sq. ft. per producer.

The effects of the Ontario Broiler Board on the producers and the location of broilder production has resulted in production being limited to counties where broiler production took place in 1965, because

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[6]Last year there were 828 producers (Third Annual Report, 5), this year there are 756 (Fourth Annual Report/Nineteen Sixty-Eight, Burlington: [March, 1969], 4), while 114 small producers sold their production quota rights (Ibid., 10).

of the rule that producers may sell quota only to member-growers. The number of growers has been reduced substantially throughout Southwestern Ontario. Although the average size of the growers' quotas has risen, quota transfers have only affected producers with less than 30,000 sq. ft. of growing space.

The board has favoured the medium sized producer in two ways: it has hindered expansion of growers having already 30,000 sq. ft. of growing space. It has allowed the small producer to either increase his quota or withdraw from the broiler business. In Essex County, for example, there were twenty-seven producers on February 1, 1968, all having less than ten thousand sq. ft. of growing space. In the ten month period, thirteen producers sold out, eleven remained the same, while only three increased their quotas. A further reduction in the number of producers in Essex County is to be expected because the average size of production unit is still less than one-third of the provincial average.

The right to produce broilers has gained monetary value since the board started to operate. In this manner, approximately fifteen million dollars has been added to the value of broiler production facilities. (Quotas are selling for about one dollar per square foot.)[7] As a result, broiler prices have had to rise to cover the increase in investment. This rise in price has weakened the competitive position of the broiler producers in relation to U.S. and Quebec producers who are not organized in marketing boards.

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[7]This price was quoted by two poultry real estate agents, both of whom indicated that the price was rising.

V INTEGRATION

No study of the broiler industry is complete without a reference to integration within the industry. "Integration refers to a coordination of management decisions extending over two or more stages in the production-marketing process . . . . It need not . . . imply complete economic integration and control through full ownership."[1]

In Ontario, integration through full ownership is relatively small in the field of broiler growing, but most of the broiler chicks are hatched by integrated firms. Contract integration implies economic control without full ownership. Throughout the industry definite working agreements exist between all levels of the industry. These agreements are necessary for a smooth functioning of the industry.

In the course of this chapter it will be pointed out how the marketing board can influence, through its policies, some of the types of integration the grower has to enter into. The effects of the board's policies on the types of integration and the size of the consumer market will be dealt with towards the end of this chapter.

Ownership Integration

Vertical integration through full ownership, also called ownership integration, will be considered initially. In August 1967, one-fifth of the Ontario broiler production was owned by 'agribusinesses'[2] in the

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[1]M.K. Leckie, "Dynamics of the Integration of Agricultural Production and Marketing", J. of Farm Economics, XL, 5 (December 1958), 1356.

[2]Agribusiness usually refers to the firms which operate between the primary producer and the processor. In this study it also includes hatcheries and processors.

following combinations:

2.3% producer-hatchery

3.6% producer-processor

7.0% producer-feedmill-hatchery-processor

7.1% producer-feedmill (some with a hatchery)

20.0% of production integrated through ownership.[3]

E.P. Roy, when reporting on the broiler industry in the United States, wrote in 1966: "About 20 per cent of the broiler output is produced by agribusiness firms on their own farms with company labor . . . ."[4] The extent of ownership integration in the U.S. and in Ontario is the same. There are no indications that ownership integration is changing in the U.S.; similarly in Ontario it remains fairly constant, because expansion can only be affected through purchase of existing production facilities. In 1968 only four independent growers sold out to integrators.[5] Usually an integrator expands through purchasing the holdings of another integrator. This type of acquisition has concentrated the broiler industry into ever fewer hands. The processing industry might serve as an example.

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[3]The author has calculated the percentages using the records of the Ontario Broiler Board. He was assisted by Mr. S. Kleinman, the board's fieldman.

[4]Ewell Paul Roy, "Effective Competition and Changing Patterns in Marketing Broiler Chickens," J. of Farm Economics, XLVIII, 5 (December 1966), 191.

[5]Ontario Broiler Board, Fourth Annual Report, 10.

Tobin and Arthur estimate that five hundred firms processed 75 per cent of the U.S. broilers in 1955. This number dropped to one hundred in 1961.[6] In 1967 W.R. Henry predicted that twelve fully integrated firms will have captured one-half of the U.S. broiler processing market by 1970.[7] The reduction of processing firms in Ontario is not as drastic as in the United States, although concentration does take place. In the past two years one integrated company sold its broiler assets, both production and processing facilities, to another integrator. In February 1969, the largest independent broiler processor announced that starting this summer it will cut its contracts with broiler growers by fifty per cent.[8] At least part of this reduction will be taken over by integrated firms.

Contract Integration

Contract integration refers to an agreement between the producer and another sector of the industry, when the producer owns his own production facilities. Contract integration may vary in form from a simple agreement that in return for buying feed and/or chicks, the feed company or the hatchery will arrange for processing, to a written contact specifying the grower's compensation for raising broilers which he never

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[6]Bernard F. Tobin and Henry B. Arthur, Dynamics of Adjustment in the Broiler Industry (Boston: Harvard University, Grad. School of Bus. Admin., Div. of Research, 1964), 101-102.

[7]"Economist predicts 1970's Top 12 Broiler Companies," Poultry Meat (Mount Morris, Ill.: Watts Publishing Company, May 1967), 60-62.

[8]"Schneiders cut Contracts," Canadian Poultry Review, LXXXXIII, 3 (March 1969), 45-46.

owns.

Roy gives the following information for the United States: "Contract broiler production from some 25,000 growers now accounts for about 75 per cent of the U.S. output. About 20 per cent of the output is produced by agribusiness firms on their own farms with company labor while the remaining 5 per cent is produced by independent growers".[9] Roy goes on to say that as time goes on "the contract grower gradually relinquishes entrepreneurial control over his broilers, except where farmers' cooperatives exist . . . ."[10] Unfortunately, Roy does not give a percentage breakdown of the different types of contracts in existence.

Contract integration data for Ontario have been compiled questionnaires sent to the producers" (Appendix A). One hundred twenty-one questionnaires were sent out, and forty-seven were returned. The returns are not sufficiently large statistically to serve as a reliable sample. This has partly been caused by the presence of a large number of immigrant producers who have an insufficient knowledge of the English language to fill out questionnaires. As a result the returns may not give a true picture of contract integration. Also the number of independent growers is probably too high, because many recent immigrant producers grow broilers on contract. Secondly, many growers consider themselves independent, while in reality they produce under a 'gentleman's

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[9]Roy, "Effective Competition," 191.

[10]Ibid.

agreement'.[12] The questionnaire results are classified into five categories (Table 11).

TABLE 11

FORM AND EXTENT OF INTEGRATION AT THE PRODUCERS LEVEL.

Category	Percentage of producer	Percentage of production
I Independent	30.4	31.1
II 'Gentleman's Agreement'	32.6	33.4
III Written Contract	26.1	21.6
IV Straight Fee	4.4	1.2
V Producer-Processor	6.5	12.7

I, Independent. The first category covers the producer who does his own buying and selling. The producer may deal with an integrated firm, but does not have to do so. This category also includes feed companies and hatcheries who do not have processing facilities and classified themselves as being independent producers. While in the U.S. the percentage production by independent growers is five, in Ontario it is 31.1, or 30.4 per cent of the producers. It has to be noted that farmers belonging to a co-operature are here classified as independent

[12] Oral understanding of mutual obligations.

growers, while this is not done by Dr. Roy. The difference in results is between 7 and 10 per cent.

II, 'Gentleman's Agreement'. This category covers the 'gentleman's agreements'. These arrangements are usually made by a feed company which seels feed, and sometimes also chicks, to a producer, and in return arranges for the processing of the finished broilers. One-third of the producers have a 'gentleman's agreement'.

III, Written Contract. The grower in the third category never owns the broilers. He raises them for the integrator and his payment depends upon his skill as a grower and upon the market price; this category covers one-fourth of the growers.

IV, Straight Fee. The grower in this category raises broilers for a straight fee. The use of this type of contract is not common, and probably on its way out. In this sample the producers had only small farms, they were fifty years of age, and they had produced broilers for at least nine years.

V, Producer-Processor. The last category covers the producer-processor combination. Production owned by this combination in reality is 10.6 per cent while the questionnaire results show 12.7 per cent. It is characteristic for this category as well as for other types of ownership integration to have a much higher than average production quota.

Categories II, III, and IV cover contract integration. The sum of these categories is 63.1 per cent of the producers, and 56.2 per cent of the production capacity. This compares with 75 per cent of the production capacity in the United States.

The percentages of categories I and II fluctuate with supply and demand of live broilers. If the broiler supply is large, integrators will insist that their growers use their feed and their chicks, thus increasing the number of 'gentleman's agreements'. Conversely, when the broiler supply is low, the insistence on feed and chick contracts will lessen, for the integrators need broilers to keep their retail markets. Since the marketing board has a fifty per cent voice in determining the size of the broiler supply, it can influence the extent of contract integration at the producer level.

Marketing Board, Integration, and Size of Market

It has been shown that, in comparison with the United States, the Ontario broiler industry is not highly integrated. It can safely be assumed that the Ontario Broiler Chicken Producers' Marketing Board is chiefly responsible for this situation; through its regulations it has accomplished at least three things: it has lessened competition between integrators by regulating broiler production, it has given a measure of prosperity to its producers, who as a result are less dependent financially on integrators, and it has made the industry more stable. The question which remains to be answered is: Have the Ontario producers lost part of their retail market in exchange for stability and temporary security?

The great majority of the people of Ontario live in the Southern part of the province. They can be supplied with broilers most easily by Ontario, Quebec, and United States producers. Two ways can be used

to measure changes in the size of the market which is supplied by the Ontario producers. The first one involves the imports and exports of Ontario and Quebec, while the second method uses the per capita production in the two provinces.

The first, and at the same time the least reliable, indicator of change is imports versus exports.[13] Exports of broilers from 1963 to 1968 for both provinces have been negligible to nonexistent, while the imports of both live chicken and dressed and eviscerated chicken have been less than two per cent of the provincial production. Quebec's imports have been rising from 1963 to 1965 and have since declined steadily. Ontario's imports on the other hand have risen steadily from almost none to one and a half per cent when compared to provincial production. These recent trends may indicate that the Quebec marketing is strengthening, while the Ontario market is becoming more susceptible to chicken imports.

The second and more reliable indicator is the number of pounds of broiler meat available to the province's population. This figure consists of the provincial production plus imports minus exports. Since imports and exports are both very small, they do not appreciably change the provincial production figure (Fig. 24).

Ontario and Quebec produced similar amounts of broiler meat on a per capita basis from 1963 to 1965.[14] In September 1965 the Ontario

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[13]Canada Department of Agriculture, Poultry Market Review, XIII-XVII (Ottawa, 1963-67). C.D.A., Poultry Market Report (Ottawa, Jan. 3, 1969), and others.

[14]Broiler production is based on chickens under four pounds, slaughtered in registered stations only. The weight is eviscerated weight.

Broiler Board started to impose production quotas on its growers and has done so every since. During this time period from 1965 to 1968 the per capita availability of broiler meat in Ontario has risen from 19.9 pounds to 21.1 pounds or one and a half pounds in three years. At the same time in Quebec the per capita availability of broiler meat rose 7.7 pounds or more than five times as much as in Ontario. The conclusion must be that either the Quebec consumer is eating much more broiler meat than his Ontario counterpart,[15] or Quebec produces many broilers for other provinces. The latter is more likely and is also confirmed by an ever large influx of Quebec broilers into Eastern Ontario. Some of the extra produce may be sold in the Maritime province, but this market is limited, for the population is small and the Maritimes produced in 1968, 23 million pounds of broilers[16] or eleven pounds per person.

Ontario's per capita production of broiler meat in 1965 was one-half pound higher than the National per capita consumption (Fig. 24), while in 1968 the Ontario figure and dropped to 1.1 pounds below the national figure.

Ontario's per capita production of broiler meat in 1965 was one-half pound higher than the National per capita consumption (Fig. 24), while in 1968 the Ontario figure had dropped to 1.1 pounds below the national figure. In other words, Ontario's per capita production has

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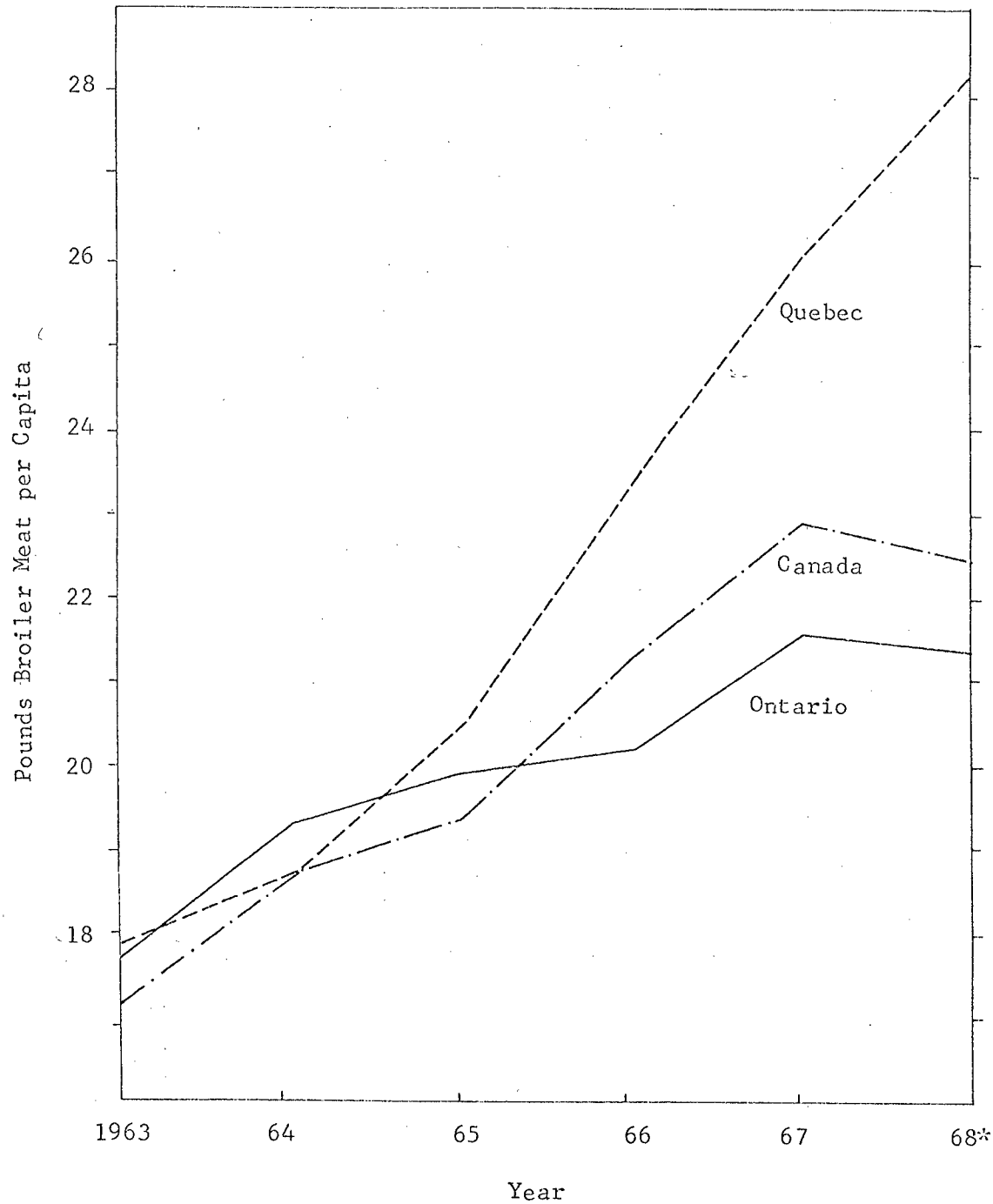
[15]No provincial consumption data are available.

[16]C.D.A., Poultry Market Report, Jan. 3, Jan. 17, 1969.

Figure 24--Per Capita Availability of Broiler Meat in Ontario and Quebec, and per Capita Consumption of Broiler Meat in Canada, 1963 - 1968.



Sources: C.D.A. Poultry Market Review, 1963-7;
Poultry Market Report, Jan. 3, 1969;
D.B.S. "Estimated Population of Canada", Cat. No. 91-201, Table 1, 1968.

*1968 data are preliminary.

lost 1.6 pounds in the last three years in relation to the national per capita consumption. In terms of production this loss is 7.5 per cent.

Integration in the Ontario broiler industry has been held at a fairly low level. This has been achieved through restrictive regulations and restricted marketings. Returns to the broiler growers have been high and the industry has become very stable. Both producers and integrators have benefited financially. However, the marketing board's policies are apparently not designed to protect the independent processors, for the largest independent processor, who will cut his processing quotas by half, has blamed his difficulties on "rigid pricing of the Ontario live broilers and its attendant problems."[17] The pricing of the Ontario live broilers is the responsibility of the Ontario Broiler Board. In exchange for these amenities the broiler industry of Ontario has lost part of its market.

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[17]"Schneiders cut Contracts," op. cit. 46.

VI CONCLUSIONS

Location Analysis

1. An increase in population is preceeded by an increase in poultry, followed by a decrease in poultry where extensive urbanization takes place.

2. The population density per county, as measured,[1] shows a highly significant correlation with broiler, pullet, and turkey densities, per acre improved land, when York County and contiguous counties are not taken into consideration. Inclusion of all counties in the correlation analysis results in elimination of the significance of the correlation, except for the broiler density, which correlation is still significant (95 per cent confidence level). The loss in correlation shows that a highly significant correlation between poultry growing and population does not hold in or next to urbanized counties.

3. Capital investment per acre in agriculture, shows a highly significant correlation (99 per cent confidence level) with broiler density, turkey density, and with the combined average density of turkeys, broilers, and pullets six months and over.

4. Promotion of broiler growing by feed companies, hatcheries, and processors has limited broiler growing to Southwestern Ontario except for three production units. Within this region, the spatial distribution of growers is clustered for two reasons: firstly, because effective pro-

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[1] See p. 42.

motion has taken place in certain areas only; secondly, because the acceptance of this new farming practice has been influcenced greatly by social contacts among growers and potential growers of broilers.

5. Since the Ontario Broiler Board has allowed producers to buy and sell their production quotas, broiler production has become more concentrated in 'suburban' counties. Recent changes in the production pattern confirm the hypothesis that broiler production increases in 'suburban' counties, but decreases in counties which become extensively urbanized.

6. In the post-war period, poultry processing plants have changed location from mostly rural areas to locations in or close to urban centres.

7. The average road distance between the broiler processing plant and its source of broilers is fifty miles. Variance from the average is influenced by location of plant, and degree of integration between processing plant and feed company.

8. In general, processing plants killing more than 35,000 broilers per week have a large sales territory than supply territory. The reverse is true for plants killing less than 35,000 broilers per week.

9. Processing plants located in Toronto have Toronto as their sales territory.

10. No Ontario broilers are sold outside Ontario, and part of Eastern Ontario is served by Quebec processors.

Broiler Flow Analysis

1. Although the main sales outlet for broilers is the chain store, great variation exists in the extent different retail outlets are used by different sizes and types of processing plants.

2. The independent store is the main sales outlet for small processing plants and plants using the New York dressed method of processing.

3. "Kentucky Fried" type outlets are served by large processing plants. The outlets sell close to one-tenth of Ontario's broilers, and their importance as a broiler outlet is increasing.

4. Chain stores are served only by processors killing ten thousand or more broilers weekly. Plants killing between 30,000 and 60,000 broilers per week sell over half of their produce to chain stores.

5. Restaurants are served by all types of processors. Percentage sales to restaurants are 7.4 per cent and are twice as high for New York dressed plants and plants killing 10,000 to 30,000 broilers weekly.

6. Ninety per cent of the broilers move from the processing plant directly to retail outlets. A similar percentage is sold fresh.

7. Between eighty-five and ninety per cent of the broilers in Ontario are processed in evisceration plants. This percentage is rising.

Integration

Integration in its widest interpretation covers three quarters of broiler production. Between one quarter and one-fifth of broiler production is owned by integrated firms. Disregarding 'Gentleman's Agreements', contract integration at the producer level is a low thirty

per cent.

Marketing Board

The Ontario Broiler Board has stabilized the broiler industry and has made broiler growing a more profitable operation. At the same time it has endangered its retail market.

Future Lines of Research

1. Although the Niagara Peninsula has been studied geographically, an in-depth analysis of farming types, land rents, and urbanization should be carried out in three to five counties of this region, covering a ten year period. This study would reveal more intricately the relationships between land use, land rent, and population. It would add greatly to the body of agricultural geographical theory.

2. The high percentage of immigrant broiler growers merits a study explaining the presence of immigrants in poultry production. The study should cover both the sociological and geographical factors.

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APPENDIX A

Department of Geography,
Waterloo Lutheran Univ.,
Waterloo, Ontario,
May 1, 1967.

Dear Sir:

Enclosed is a questionnaire relating to your broiler operation. The purpose of this questionnaire is to gather data on the size and location of broiler farms in Ontario to:

1. Construct a flow chart of the broiler production;

2. Establish the connections between the stages of the broiler industry from hatchery to consumer;

3. Predict the future development of the industry.

This questionnaire is a small, but very important part of a study which will analyze the whole broiler industry. This task cannot be accomplished without your co-operation. It is therefore essential that you answer the questions as accurately as possible.

Information about your operation will be treated as confidential and any results will be grouped with others according to size and/or situation before publication.

This questionnaire is sent to you under the auspices of the School of Graduate Studies at Waterloo Lutheran University, Waterloo, and in co-operation with your Broiler Board. This study is conducted by undersigned to complete his requirements for the Master of Arts degree. Your co-operation is sincerely appreciated.

A copy of the study will be available to your Broiler Board.

Fred Wind.

CONFIDENTIAL

PRODUCER'S QUESTIONNAIRE

GENERAL

Type of ownership of broiler operation: Individual or family _____, Partnership_____, Company or Corporation_____, Other (please specify) _____.

In or near what place is your broiler farm located? _____
(If you own more than one, please state here the total plus the total floorspace._____farms, _____sq. ft. Now continue with above.)

Total quota on above farm _____sq. ft.

Size of holding _____acre.

Distance to nearest town, _____miles.
Name _____and size_____of this town.

Are you the original owner of this broiler operation? yes_____, no _____.

When did you start growing broilers? Year _____.

Age of farm owner (if applicable _____years.

How long yet do you expect to grow broilers at this location? _____yrs.
If less than ten years, please indicate why._____
_____

Is your operation run by: Owner's family ____, Manager ____, Tenant____.
Other (please specify)_____.

If operation is rented, is the whole farm rented ____, or the building space only _____?

If building space is rented only, who is the tenant?_____

Which other sources of income do you have? (Please list in descending order of importance)_____

Which percentage of your net income comes from your broiler farm?____%.

Did you grow your allotted quotas during the past four quota periods?
yes ____, no____.

If no, in which quota period did you underproduce and why?_____
_____

MOVEMENT

Location of hatchery supplying your chicks: _____

Location of processing plant(s) taking your birds: _____

_____

Percentage Junior broilers you have grown in the last two quota periods _____%.

Would you grow a higher percentage Junior broilers if possible?
yes no don't care

If yes, why? _____

_____

This past year, have you been growing your broilers:

i. as an independent operator (you handle your own buying, selling, insurance, etc.);

ii. under a "gentlemen's agreement" (feed mill arranges delivery of chicks and finding a market for the broilers, while you handle the rest);

iii. under contract for a feed mill (feed mill handles buying, selling, insurance, while you make a profit or loss);

iv. for a straight fee (x cents/bird) for a processing plant;

v. for your own processing plant;

vi. otherwise (please specify) _____

_____

Any comments you may have with respect to this questionnaire, your broiler operation, or your marketing board _____

_____

_____

_____

Please return this questionnaire in accompanying envelope

before May 20,1967.

APPENDIX B

Department of Geography,
Waterloo Lutheran Univ.,
Waterloo, Ontario,
May 19, 1967.

Dear Sir:

Enclosed is a questionnaire requesting some information concerning your processing plant. All questions refer to broiler chickens only. The purpose of this questionnaire is to:

1. Construct a flow chart of the broiler production chain in Ontario;

2. Establish the connections between the stages of the broiler industry from hatchery to consumer;

3. Predict the future development of the industry, with special emphasis on marketing.

This task cannot be accomplished without your co-operation. Since this questionnaire is a very important part of the study and since only you know the answers, it will be appreciated very greatly if you would take the time to answer the questions as accurately as possible.

Information about your operation will be treated as confidential and any results will be grouped according to size and/or situation with others before publication. If, in your opinion, this questionnaire does not adequately cover your broiler processing plant, please make the necessary changes or note it on the bottom and I'll be in contact with you.

This questionnaire is sent to you under the auspices of the School of Graduate Studies at Waterloo Lutheran University, Waterloo, and in co-operation with the Ontario Broiler Board. However, the opinions and recommendations resulting from this study, which will be published this fall, are attributable to the author only. This study is conducted by undersigned to complete his requirements for the Master of Arts degree.

Your co-operation is sincerely appreciated.

Fred Wind.

PROCESSOR'S QUESTIONNAIRE

GENERAL

1. Location of your plant: _____
2. When did this plant start processing broiler chickens? _____
4. Type of ownership of this processing plant:
   Individual or Family ☐ Partnership ☐ Subsidiary Company ☐
   Independent or Mother Company or Corporation ☐
   Other (please specify) _____
5. If your Plant is a subsidiary, what is the name of the Mother Company? _____

COLLECTING

6. Taking average conditions of the last four months, please fill out the sources of your broilers according to the breakdown outlined below (data in percentages)

	Broilers (over 3.4# ave.)	Juniors (2-3.4# ave.)	Rock Cornish	Total
Own Farms				
Renting of Farm space				
Independent Growers				
.....				
.....				
				100%

18. Percentage of birds collected within
   a 25 mile radius ____%
   a 50 mile radius ____%
   a 75 mile radius ____%
   a 100 mile radius ____%
26. Average weekly kill _____ birds.

DISTRIBUTION

35. Sales of the eviscerated product:

	Broiler	Junior
as a whole chicken	____%	____%
cut up in parts	____%	____%
.....	____%	____%

DISTRIBUTION (cont'd)

54.

	Broiler	Junior	Rock Cornish	Total
Chain Stores				
Indep. Stores				
Wholesalers				
"Jobbers"				
Secondary Processors				
Institutions (Schools, Military)				
Eating Places				
				100%

55. Percentage delivery of your product within

a 25 mile radius ____%

a 50 mile radius ____%

a 75 mile radius ____%

a 100 mile radius ____%

65. Population centres to which you mainly ship:

Name	Percentage
.....	____%
.....	____%
.....	____%
.....	____%

76. If you sell any chicken outside Ontario, please state which kind and which quantity. .....

.....

Please return this questionnaire in accompanying envelope

before May 27, 1967.

THANK YOU.

APPENDIX C

Department of Geography,
Waterloo Lutheran Univ.,
Waterloo, Ontario,
October 1, 1968.

Dear Sir:

Last year I started my research on the Ontario broiler chicken industry, with special emphasis on the geographical location and the distribution of the final product. Much work has been accomplished last year, but progress was interrupted by a year of teaching high school. Now once again I am working full time on my research, leading to a Master of Arts degree. Results of my work should be available in February 1969.

Accompanying this letter in a questionnaire designed to give you, Sir, an outline for a breakdown of your business according to the form in which, and the type of outlet to which your produce is sold. I am sure that you, as a businessman, know the importance of such data for the detailed analysis of the welfare of your firm.

One of the greatest tasks of my research is to compile the provincial picture of production, processing, distribution, and consumption of the broiler chickens. This provincial picture, when divided into size classes at the processor level, will furnish the broiler industry with an accurate portrayal of the Ontario market. It is then your turn to compare your business with the total industry.

The accuracy of my work will depend greatly on your co-operation. I may mention that s slightly less detailed questionnaire with more emphasis on procurement, which was sent to the broiler processors last year, was returned by seventeen processors covering just over half of the Ontario kill. Averages from these have been calculated and the results will be incorporated in my thesis. Although returns were adequate for statistical purposes, I hope that with your co-operation (and for the benefit of the broiler industry) returns will be somewhat greater this time. The extra questionnaire is for your records.

The questionnaire should cover a whole year, preferably from September 1, 1967 to August 31, 1968. The average weekly kill figure is most important since the results will be divided into groups based on the weekly kill. Of course any data received from you will be treated confidentially and any group will contain at least three processors. If you are unable to answer all questions let this not discourage you to return the questionnaire.

Greatly indebted to you for your help, I remain,

Sincerely yours,

Fred Wind B.S.A.

CONFIDENTIAL

Department of Geography
Waterloo Lutheran University
Waterloo, Ontario

CONFIDENTIAL

Processor's Questionnaire

Broiler Chickens:

1. Procurement of live birds:
   - i. Own Farms_____ % ____
   - ii. Owner-integration contract % ____ (chicks are never owned by grower)
   - iii. Feed and/or chick contract % ____ (you specify feed and/or chicks)
   - iv. Sales agreement only % ____

   100 %

2. Type of Processing:
   - i. Eviscerated (high scald) % ____
   - ii. New York dressed (low scald) % ____

   100 %

3. Form in which processed broiler is sold:

item \ form	Ice-packed___%	Frozen___%	Pre-cooked___%	Chilled___%	+=100%
whole chicken	%	%	%	%	
legs + breasts	%	%	%	%	
wings	%	%	%	%	
necks + backs	%	%	%	%	
liver, heart, and gizzard	%	%	%	%	
	100 %	100 %	100 %	100 %	

4. Outlets used and one or two major products for each:

	Percent.	Major item (s)
Independent stores	%	
Chain stores *	%	
Wholesalers	%	
Secondary Processors	%	
Institutions (Schools, Military)	%	
"Kentucky Fried" type outlets	%	
Restaurants	%	
	100 %	

* Four or more stores

CONFIDENTIAL CONFIDENTIAL

5. Distribution to Major population Centres:
   Location of this Processing Plant: _____
   Average weekly kill during the past year: _____ broilers

Major market	Percentage of sales	Major items sold	Distance to market
i.	%		miles
ii.	%		miles
iii.	%		miles
iv.	%		miles
v.	%		miles

6. Broiler chickens are often divided into broilers and junior broilers. The boundary may be set at 2.5 lbs. eviscerated weight. They often demand different outlets as may be shown below.

Type	Outlet (as in 4.)	Major item (as in 3.)
Broiler	a.	-
	b.	-
	c.	-
	d.	-
Junior broiler	a.	-
	b.	-
	c.	-
	d.	-

7. Number of broiler items for sale: _____

A speedy return will be greatly appreciated. Thank you.